The

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LIST OF FOREIGN AGENTS (see first page "Official Notices").

## Contents:

| | PAGE |
|---|---|
| Electricity Supply during the Crisis | 777 |
| The Electric Propulsion of Ships | 778 |
| False Economy | 778 |
| Italian Engineering | 779 |
| Fuel Economy | 779 |
| High-Pressure a.c. Rectification | 779 |
| The I.E.C. Meeting in America—III (*illus.*) | 780 |
| How the Supply of Electricity was Maintained during the Strike | 782 |
| Transformer Oil and its Treatment, by A. D. Jukes | 784 |
| International Standardisation | 786 |
| Parliamentary News | 787 |
| Correspondence— | |
| Strike Profiteering | 787 |
| Engineers and Labour Disputes | 787 |
| The Resistance and Heating of Lampholders | 787 |
| Country-house Fires | 787 |
| The Heating of Buried Cables—Report No. 2 | 788 |
| Burgh of Hamilton—Electrical Engineer | 788 |
| Electricity Meters | 788 |
| Reviews | 788 |
| Business Notes | 789 |
| Lighting and Power Notes | 793 |
| Tramway and Railway Notes | 794 |
| Hydroelectric Power on the Lower Isère, by T. Rich (*illus.*) | 795 |
| Telegraph and Telephone Notes | 799 |
| Radio Notes | 799 |
| Contracts Open and Closed | 800 |
| Forthcoming Events | 801 |
| Notes | 801 |
| Institution Notes | 802 |
| Our Personal Column | 802 |
| New Companies Registered | 803 |
| Official Returns of Electrical Companies | 803 |
| City Notes | 803 |
| Stocks and Shares | 806 |
| The Ruths Steam Accumulator, by Alfred J. T. Taylor (*illus.*) | 807 |
| Empire Wireless Communication, by W. H. Eccles | 809 |
| The Electricity (Supply) Bill | 810 |
| The Electric Propulsion of Ships | 811 |
| The National Physical Laboratory | 813 |
| New Electrical Devices, Fittings, and Plant (*illus.*) | 814 |
| The Economic Situation in Belgium | 815 |
| Legal | 816 |
| Trade-Mark Applications | 816 |
| Contractors' Column | Advertisement page xxxvi |

# Electricity Supply During the Crisis.

LOOKING back on the events in the electrical world during the recent period of industrial turmoil, an account of which we publish elsewhere in this issue, one cannot but be astonished at the remarkable ease, considering the chaos outside, with which the supply of electricity was maintained. Very few shut-downs were experienced, and those that did occur were in no way due to incapacity on the part of the loyal men to deal with the operation of the plant under emergency conditions. Again, the number of important stations in all parts of the country which, apart from reduced loads, were not in any way affected is almost incredible. Although the success achieved in keeping the machines running was due in great measure to the efficiency of the elaborate emergency schemes, both national and local, which had been prepared months ahead, in the main it was due to the British character of the men who carried on, in many cases under extreme difficulties and hardships. In almost all cases where trouble arose the supply was maintained by the technical staff, which, in practically all instances, consisted of members of the Electrical Power Engineers' Association. We heartily congratulate the E.P.E.A. on the attitude it adopted when the storm clouds appeared, on its passing the "carry on" resolutions, and also on having in its ranks the men who bore the brunt of the situation, involving, in many cases, manual labour.

In the numerous undertakings which were unaffected by the strike there were many men, members of the Electrical Trades Union and similar organisations, who, contrary to instructions from their unions, remained loyal to their undertakings. Great credit is due to these men; it required some courage on the part of the members to defy the unconstitutional instructions of their executives.

The thanks of the industry and of the community are also due to those outside the industry, including many of the fair sex, who came forward with a helping hand.

Many of these volunteers worked hard for long hours under great difficulties, and on unaccustomed duties.

While the successful running of the industry was due mainly to the determination of the participants abovementioned to maintain the supply at all costs, their efforts were the more fruitful as the result of the elaborate plans of the Electricity Commissioners. It is an open secret that these gentlemen had prepared months ahead for such an emergency, and it is whispered that the large number of volunteers who were enrolled were not nearly exhausted. Nor must we overlook the part the Admiralty played in the struggle by co-operating with the Commissioners.

Probably the attitude of certain municipalities with Labour majorities in the control of their undertakings during the crisis has done a good deal to support the suggestion that the general strike was not purely an industrial affair. Certain of these councils appeared to be dissatisfied with the lack of control which the T.U.C. had over their own undertakings, and enlarged on the measures laid down by that body. Many industrial concerns were unable to obtain electricity supplies as the result of the action of some of these authorities. This raises the question of the legality of withholding the supplies, and we understand that the advisability of taking legal proceedings is being considered by some of the firms affected. The action of the St. Helens Council in introducing additional charge engineers into its works will, we believe, require a good deal of explanation.

While it is the desire of all well-meaning men to see as many as possible of the strikers reinstated in their old jobs, it is to be hoped that all employers will support the Prime Minister in his pledge to stand by those who were loyal to the country during the time of trouble. An unsatisfactory situation appears to have arisen in one case, where the chairman of a committee has been compelled to resign as the result of his having neglected the volunteers who were employed during the strike.

One unhappy result of the conflict is the strained feeling which has already been evidenced in the working of certain of the District Joint Councils. The electricity supply industry has during the past six years been able to congratulate itself on the amicable settlement of its disputes through the medium of these bodies; we sincerely hope that both sides will do their utmost to redress any damage to the good feeling within these valuable councils which has been brought about by the breaking of agreements. With regard to the District Joint Boards (employers and technical staffs) the good feeling has been strengthened by the part played by the E.P.E.A., and any doubts which may have existed, as the outcome of the differences of a few years back regarding the relationship between the E.P.E.A. and the E.T.U., have been removed.

**The Electric Propulsion of Ships.**

It was only to be expected that the discussion which followed Mr. Eskil Berg's paper on "The Electric Propulsion of Ships" (an abstract of which appeared in our issue of February 26th, page 352), should have revealed a disposition to question whether the superiority which the author claimed for the electric drive over the drive through mechanical speed-reduction gearing was justified by actual results. In this country, despite the fact that we were the pioneers in the use of electrical machinery for the propulsion of ships, and also despite the fact that we have built and equipped some of the largest merchant ships which have been fitted with this form of machinery, our shipbuilders and marine engineers have not yet become convinced that for many purposes electric propulsion is superior to all other forms, and they naturally hesitate to accept the claims put forward by our American cousins, who have proved by actual experience with a number of ships of all sizes ranging from the biggest battleship down to small harbour tugs, that the electric drive is better than the system of propulsion which they themselves adopt. There has recently been published in the *Transactions* of the North-East Coast Institution a verbatim report of the discussion which followed the reading of Mr. Berg's paper, as well as a number of items contributed by members who were unable to be present when the paper was read. Much of this discussion—an abstract of which appears on page 811 of this issue—was of a distinctly helpful nature, and together with Mr. Berg's replies to the questions raised, it constitutes a further store of information on this important subject. But where the discussion took the form of questioning the accuracy of the facts given in the paper, or doubting whether the author was not inclined to view his subject in rather too optimistic a light, Mr. Berg was able to show that all that he claimed for the electric drive had already been justified by results actually obtained.

This problem has an interest for the power-station engineer on land as well as for the marine engineer, and the former will read with interest Mr. Berg's remarks on the advantages of the large single-casing turbine as compared with that in which the expansion of the steam occurs in two or more casings. He will note with interest as indicating the trend of power-station practice in the United States, that in that country there are about fifty turbo-generators of 50,000 h.p. running at a speed of 1,800 r.p.m., each built in one casing and all giving high economy. This certainly substantiates the claim that where large powers are required for the propulsion of the fastest and biggest ships, the use of the electric drive enables the number of turbine casings to be greatly reduced, and no doubt this is one reason why the electric drive finds such favour in the United States Navy for the propulsion of battleships and battle-cruisers of the super-Dreadnought type. But the limitations imposed by the Washington Treaty greatly restrict the number and size of battleships which can be built by the naval powers of the world, and electrical engineers will look hopefully towards the adoption of the electric drive for large passenger liners and cargo ships. Mr. Berg appears to be in no doubtful frame of mind as to whether the decision to employ the electric drive for the passenger ship of 17,000 horse-power, the machinery of which was described in his paper, was an eminently wise one. We look forward to obtaining further particulars of the propelling machinery of this vessel, and in due time to have results of the actual trials of her machinery at sea. The latter, it is to be hoped, will prove to be just as satisfactory as have those of the battleships in the United States Navy and thus prove that electricity can be successfully employed not only for the propulsion of vessels of war, but also for large passenger liners. In this way the scope for the electric drive will be considerably widened.

**False Economy.**

Most of the publicity literature issued by British manufacturers and others in search of foreign trade is of a high-class character. It is recognised by most people that failure to make a good first impression is almost sure to be fatal. The appearance and general "get-up" of a trade list or catalogue go far to make that good impression. The quality of the descriptive matter, illustrations, and other contents must, of course, be such as to maintain the interest, stimulate further inquiry and produce the actual order or contract, but "literature" which, while it contains useful information, is so badly produced that it is ignored or is consigned to the W.P.B. with contempt is not only valueless but worse. All of this may seem so obvious to readers that they may wonder why in these days of publicity activity and propaganda specialisation we occupy our space with such remarks. Our justification lies partly in our own observation of the poor "stuff" that some traders circulate, but especially at this moment in a communication that has just reached us from a very large and important electrical purchaser abroad. Our correspondent, who is constantly in the market for products ranging from the smallest electrical detail to the largest steam and electrical equipment, has sent us some deplorably-produced trade circulars and letters received from a British firm. They are single sheets of the manifold typewritten

class, which are so badly printed that in places they are altogether unreadable; a lot of matter is jumbled together in such a form that it is really painful even to try to read it. Cheap paper, back-slum style of letter heading or none at all, are other characteristics of these cheap specimens of business-killing literature. Far be it from us to magnify the importance of this particular case; we know well enough it is not representative of British manufacturers' methods, and sometimes we have regarded such circulars as the product of cheap and questionable importing houses of the here-to-day and perhaps gone to-morrow class. Our correspondent asks us to warn British manufacturers of the futility of sending such literature abroad, and he adds that in all the matter that reaches him from the United States—and it is very considerable—he has seen nothing like the papers upon which we comment. To this we may add that not only does the circulator of discreditable literature lose through skin-flint economy, but British trading prestige may suffer also.

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**Italian Engineering.**

In its issue for March, 1926, our Italian contemporary *L'Energia Elettrica* makes a bitter attack upon our special correspondent in Italy, in respect of the introductory portion of his article on "The Italian Electrical Industry," which was published in our issue of January 1st, 1926, and upon ourselves, declaring that the critical comments of our correspondent were not only without a basis of fact, but were offensive to the whole body of Italian engineers. The demand is made that our correspondent's name shall be revealed, and that his assertions shall be either substantiated or withdrawn—failing which, we are told, we shall incur the contempt of all decent people ("disprezzo degli uomini onesti").

The impatience of criticism displayed by our Italian friends, as we shall continue to regard them, seems somewhat exaggerated to those who dwell in a country where the freedom of the Press is regarded as a fundamental factor in the liberty of the nation. However, in the interests of international harmony and goodwill we shall not pursue that line of thought, but will content ourselves with the assurance that the comments of our correspondent were made in good faith and with the best intentions; and, if the form they took was not the most acceptable to Italian readers, he shares with us regret that they should have wounded the susceptibilities of those engaged in the construction of Italian hydro-electric installations.

In publishing the letter of Ing. Giacinto Motta, president of the National Association of Electrical Industries, in our issue of February 5th, we appended the explanation of our correspondent, and added an expression of our satisfaction on learning from Sig. Sartori that out of 95 large dams built in Italy, only one (the Gleno dam) had failed. That is a record of which Italian engineers may well be proud, and we freely admit that it goes far to counteract the forebodings of our correspondent.

For the rest, we suggest that our contemporary has taken too serious a view of the matter, putting upon it the worst construction possible, and ignoring the friendly and commendatory remarks contained in the body of the article complained of, which, after all, was an account of the progress of the Italian electrical industry and not a technical treatise on water power. With the request to divulge the name of our correspondent we shall certainly not comply; to do so would be contrary to the traditional practice of the English Press, and a breach of confidence which would indeed bring us into contempt. Our reputation for justice and integrity, fortunately, does not rest in the hands of our Italian contemporary.

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**Fuel Economy.**

THE recent formation of an Institution of Fuel Economy Engineers (announced in our issues of January 1st and February 26th) is a step in the right direction, although the multiplication of associations tends to become somewhat bewildering. The objects of the new Institution are to promote fuel economy and to enable engineers to exchange experience regarding fuel and combustion. The membership is limited to engineers and others who are technicians in fuel consumption. The question of fuel economy is a vital one for electricity supply undertakings, and anything that impresses its importance on the actual executive officers of an undertaking is of immediate value to the financial side of the concern. Especially is this of importance in the smaller undertakings, where it is no one's special job to maintain scrupulous economy in the stoking and general combustion arrangements. It might pay such undertakings to give special encouragement to their engineers to become members or associate members of the new Institution. A glance at the fuel consumption returns of the Electricity Commissioners will indicate that there is ample margin for economy; there are over 200 stations with an average of more than 4 lb. of coal per kWh, a good number being over 7 lb. If we take fuel costs, we find a considerable number ranging upwards from 1d. per kWh sold.

As we have shown on previous occasions, the cost of generation is a minor factor in the total cost of supply, except to long-hour consumers; but it must not be inferred that we would underrate the importance of economy in this, or any other, department of the electricity supply industry, and in most cases it is in the boiler house that the largest saving in working costs can be effected.

As the Institution of Fuel Economy Engineers is collaborating in the movement to form an Institution of Fuel Technology, reported in our issues of March 12th and April 9th, we take it that there is no rivalry between the two bodies, which will eventually form one association.

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**High-pressure A.C. Rectification.**

IN view of the high pressures now employed for long-distance transmission, and the necessity of employing the mains to the best advantage, it is important to keep in mind the possibilities of rectified alternating currents in this connection, and the progress that is being made in the development of the thermionic valve type of apparatus. Rectifying valves, it is true, can at present deal with only very small currents; on the other hand, they can cope with very high pressures indeed, and a small current at a high pressure means considerable power. Valves are made capable of withstanding a maximum inverse voltage (instantaneous value) of 100,000 V, and carrying a current of 0.25 A, which corresponds with a power of 25 kW. Such valves can be put in series for higher voltage, or in parallel for higher amperage, and their efficiency is extremely high. As we pointed out in our issue of December 19th, 1924, the fluctuations usually appearing in the rectified current can be removed by suitable design of the a.c. generator, on the lines explained by Mr. F. W. Maxstadt, giving practically constant current.

Since, for the same stress on the insulation, a line carries twice the power with direct current that it can carry with alternating current, at the same efficiency, it is obvious that the use of direct current implies economy in first cost; it has other advantages, such as the absence of dielectric hysteresis, and the only bar to its employment is the present want of an equally simple means of reconverting it to alternating current of any desired frequency. But this function can also be fulfilled by thermionic or electronic valves, on a small scale, and it is only a matter of time for the method to be developed until it is capable of handling large powers. This subject was dealt with in the papers by the late M. Maurice Leblanc, of which we published translations in our issues of September 8th and 15th, 1922.

That there is a real demand for a system such as this was shown by the exhibit of the Highfield-Calverley "Transverter" at the British Empire Exhibition. One of its great merits is the ability to couple together two undertakings which operate at different frequencies.

# The I.E.C. Meeting in America.—III.

## A Cursory Account of the Proceedings.

By PHEIDIPPIDES.

THE most important point dealt with by the Committee on Rating was the question of permissible temperature rise for electrical machinery. At the Hague meeting, held in April, 1925, a complete list of permissible temperature rises had been tentatively agreed, and in the meantime considered by the National Committees. It is very satisfactory to find that after this detailed consideration all delegates were able to report that all the National Committees were in agreement with the Hague proposals.

As this is the first occasion on which Germany has been officially represented since the war, this meeting is of special importance and interest. During the past thirteen years German practice has diverged somewhat from that advocated by the I.E.C., so that it was a satisfaction to everyone to find that, after a very full discussion, the German representatives were able to agree to all the proposals in spite of the fact that in certain (but unimportant) points the temperature rise alternatives accepted were different from those at present given in the V.D.E. rules.

Agreement was also reached on the question of dielectric tests for electrical machinery, and an important discussion took place on the subject of embedded temperature detectors. Several questions, such as tolerance on test results, method of stating efficiency, spark-gap dimensions, &c., were discussed in detail, and it was decided to submit these items to the various National Committees.

The work of the Rating Committee was very materially expedited through the assistance given by Prof. Feldmann, of Delft University, who prepared the report for the plenary meeting.

The official British delegate on the Committee on Traction Motors was Mr. Peck, and several long meetings were held at which controversial points were subjected to a very searching examination. Much discussion took place on the classification of rating, temperature rise, ambient temperature, conditions of test, and voltage during test, but it appeared that most of the difficulties were language difficulties, and that on all basic principles there was substantial agreement. Subject, in certain cases, to the agreement of the French National Committee, it was decided to retain three classes of rating for traction motors: (*a*) Continuous; (*b*) one hour; (*c*) excess current; to measure temperature by resistance; and to adopt 25 deg. C. as a standard ambient temperature. The rating of field-control motors should specify the excitation corresponding to the rating, and the rating test should be made at that excitation. For all tests, except the continuous-load test on totally-enclosed motors, the rated voltage should be adopted, but for the exception a reduced voltage will be specified.

Certain questions on temperatures in totally-enclosed motors, and commutation temperatures for class A and B insulation, were also referred to National Committees.

The work of the Committee on Insulating Oils, presided over by Mr. Fulweiler of the A.S.T.M., resolved itself largely into a question of deciding on methods of studying the properties of an oil in order to determine its suitability for electrical purposes. It was felt that a definite distinction should be made between what may be called research tests and other tests employed for acceptance purposes. Different nationalities have at the present time different standard methods of testing for acceptance purposes, particularly for studying the properties, and the time is not ripe for replacing these by one international test. Useful work was, however, found to be possible in standardisation of the research test, and the wide field was narrowed down to four tests, eliminating a distinction which has existed between countries since the question of insulating oils was first studied by the I.E.C. at the Hague meeting a year ago.

There have been three separate groups of organisers in operation in these different countries, tiding over the period prior to complete unanimity, but it has now been agreed to combine the activities of these three groups under one central office which will make for more uniform action.

In addition to the main point, sludge tests, it has been agreed that viscosity shall be expressed in kinematic viscosity units, centipoises, and for the cold test it was agreed to adopt the United States " pour " test. Both the viscosity and the cold tests must, however, be referred to the National Committees. The British delegate on this committee was Mr. A. R. Everest.

The Committee on Prime Movers, which dealt with hydraulic and steam turbines, held a number of meetings, under the very able presidency of Doctor Durand (U.S.A.). The great need of international standardisation of definitions, general conditions covering tests, and methods of making tests, was realised by all the delegates, and as a very evident desire was manifest on the part of all nationalities to adjust any points of difference for the common good of the Commission, great progress was made.

As regards Hydraulic Turbines the British National Committee, through the delegates, Mr. C. P. Sparks and Mr. F. Wallis, put forward proposals, as requested at the Hague meeting last year, and they were taken as the basis of discussion. The proposals were under two heads, Section 1 covering General Hydraulics, and Section 2 Hydraulic Turbines, and finally a report was adopted covering both these items. This report dealt with the subject in a clearly defined manner that should render it of great practical value to purchasers and manufacturers alike.

The Steam Turbine section of the Committee submitted a somewhat similar report, and added the recommendation that the Committee should develop (*a*) a commercial code on the lines of the British proposals to include matters not strictly technical, and (*b*) a strictly technical code, on the lines of the Test Codes of the American Society of Mechanical Engineers, but amplified to include methods and instruments in use in various countries.

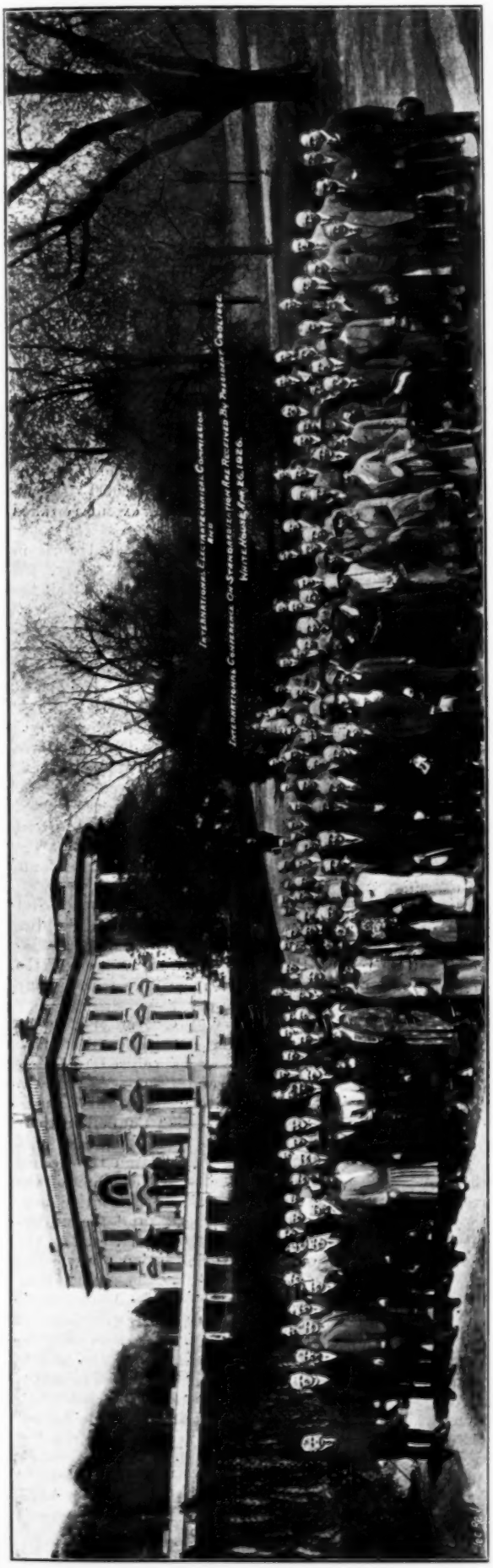
The question of standardising lamp caps and sockets originated at the Geneva Conference, and the matter was referred to a Special Committee at the Hague meeting held in 1925. Whilst progress had been made, however, there still existed a considerable difference of opinion between certain of the various National Committees.

So far as the Edison screw type is concerned, the question was then referred to the Lamp Manufacturers' Committee, which meets under the chairmanship of Dr. Holst, with the request that that Committee should endeavour to compromise the members' views and report to the New York meeting.

Dr. Holst's Committee has given the matter much consideration, and whilst at the moment a unanimous report is not forthcoming, it is anticipated that a satisfactory conclusion of the discussions will be arrived at in the course of the next few months.

With regard to the question of the Bayonet type, it was reported at the Hague meeting that the principal difference of opinion existed between the British and French Committees, which were requested to endeavour to come to some agreement.

In the interim between the Hague and New York meetings, the two Committees have considered the question, and as the result of a meeting which was held in Paris in November last, agreement was reached. This



has been reported to the full Advisory Committee meeting held in New York, which has adopted the conclusions arrived at by the British and French Committees. At the New York meetings the British delegate was Mr. E. G. Batt.

The result achieved means that international agreement has been reached with regard to dimensions of bayonet-type lamp caps and lampholders, giving complete interchangeability of various manufacturers' products.

The Committee on Standard Pressures held three meetings under the chairmanship of Professor Lombardi, the British delegate being Mr. C. P. Sparks. The question of standardising pressures at consumers' terminals, already examined previously to some extent at Geneva and The Hague meetings, was carried a step further, and the ultimate recommendation was to adopt two alternative series of voltages as follows:—

| D.C. | | A.C. Single-phase. | | 3-phase (between phase and neutral). |
|---|---|---|---|---|
| 110 | ... | 110 | ... | 110 |
| 220 | ... | 220 | ... | 127 |
| 440 | ... | — | ... | 220 |
| 115 | ... | 115 | ... | 115 |
| 230 | ... | 230 | ... | 133 |
| 460 | ... | — | ... | 230 |

The following voltages were standardised for transmission purposes:—1,000, 3,000, 6,000, 10,000, 15,000, 20,000, 30,000, 45,000, 60,000, 80,000, 100,000, 150,000, 200,000, and 300,000 volts (mean value at consumers' terminals).

These values are to be known as nominal I.E.C. pressures of the network, and the maximum pressure at the generator or secondary terminals of transformers is to be considered to be about 10 per cent. higher to compensate for line drop.

For use in new systems, the preferred mean transmission voltages are recommended as follows:—6,000, 15,000, 30,000, 60,000, 100,000, 200,000 volts, with the same 10 per cent. increase at the transmitting end. The consideration of the permissible variation of voltage was deferred until a later meeting of the Commission.

The Advisory Committee on Symbols under the chairmanship of Lieut.-Colonel K. Edgcumbe, was able to report considerable progress in the agreement on symbols for general graphical use on diagrams and layouts, hundreds of symbols, including about eightly more particularly suitable for use in traction lay-outs, being submitted to the plenary meeting for adoption.

The international employment of the same symbols for the various types of machine, circuit breaker, conductor rail, and overhead material—to take a few examples at random—should go a long way in the direction of simplifying the reading of diagrams and drawings without reference to any "key," a consummation devoutly to be wished.

An important discussion took place on the letter symbol for the ohm. The V for volt and A for ampere have long been accepted internationally, but as regards the third member in the electrical trinity no agreement had prior to this conference been possible.

It has now been unanimously decided, however, to adopt $\Omega$ as the symbol for ohm, and the megohm will be represented by $M\Omega$. It should, perhaps, be pointed out that this decision does not affect the use of R as the symbol for resistance, but only covers the *unit* of resistance, *i.e.*, the ohm.

There has for some time been a difference of practice in the method of indicating the polarity of a battery, when using alternate long and short strokes, as to which shall be the positive and which the negative pole. After discussion, it has now been decided to recommend to the National Committees that they should make the long thin line the positive pole, which practice appears to have ample historical precedent.

The delegates of the International Electro-technical Commission were received individually by President Coolidge at the White House, Washington, on April 24th. We reproduce herewith a photograph of the group taken in the grounds after the reception.

# How the Supply of Electricity was Maintained during the Strike.

## Some Interesting and Amusing Incidents.

WE refer in our leading columns in this issue to the comparative ease with which the supply of electricity was maintained during the recent general strike. This and the normality, apart from reduced loads, with which very many undertakings, including large and important ones, in all parts of the country were able to carry on were the outstanding features of the situation. The Yorkshire Electric Power Co. reports no notable events during the strike; every man in the employment of the company remained at work, and the supply was given normally as required. The Birmingham Electricity Supply Department, where the men refused to act unconstitutionally in spite of definite instructions by the local trade-union branches to cease work on May 11th, was similarly fortunate, and the Sheffield undertaking was not affected in any way; Salford also carried on as usual with the full staff. Among the other undertakings which were able to operate normally, as far as the employés were concerned, were Nottingham, Carlisle (although here the men were notified three times by the unions that they were to be called out, the order being cancelled each time, due, it is believed, to reluctance on the part of the men to come out), Swansea, Manchester, Altrincham, Blackpool, Coventry, Wolverhampton, Stafford, Hereford, Birkenhead, Bury, Wigan, Dundee, Perth, Plymouth, Southampton, Barrow, Belfast, Tynemouth, Glasgow, Crewe, Liverpool, Woolwich, Bedford and Manchester. The following supply companies were also unaffected:— The Shropshire, Worcestershire & Staffordshire Electric Power Co., the Halesowen Lighting & Traction Co., Ltd., the Tewkesbury Electric Light Co., Ltd., the Kidderminster & District Electric Lighting & Traction Co., Ltd., the Ludlow Electric Light Co., Ltd., the North Wales Power Co., Ltd., and the Mersey Power Co., Ltd. The position in the Newcastle Electric Supply Co.'s undertakings was that in some of the stations the men ceased work, while in other cases they remained on duty; it is reported that the men generally were reluctant to cease work.

In many instances the whole of the manual workers left their posts at the commencement of the strike, and the supply was maintained by the technical staff with the aid of volunteers. This was the case at Poplar, St. Marylebone, Bristol, Aberdeen, and other undertakings. In some places, including Fulham, Hammersmith, Hackney, and Islington, naval ratings were introduced to replace the strikers.

In the North Metropolitan Electric Power Supply Co. the men ceased work at different times in the Brimsdown, Willesden and Hertford power stations. The St. Albans power house was not running at the time as the company was receiving the supply for this area from Luton. The Hertford station was shut down, and the supply throughout the area was maintained from the other stations by volunteers and naval men. A Diesel set was run at St. Albans in order to conserve the coal supply. During the first few days of the strike the tramways were shut down, and this relieved the system of 5,000 to 6,000 kW.

There appears to be a misunderstanding in some quarters regarding the supply at Willesden, where a bulk supply is received by the Willesden Council from the North Metropolitan Co. The Council men at Willesden left work on May 7th, and for the following three days the supply in this district was not available to consumers during the day-time. This was not due to the Willesden power station, which was originally the Council's property, shutting down; the bulk supply to Willesden was available during the whole of the strike.

At Wimbledon 133 men left work on the first day of the strike, three returning before the strike was declared off. Five naval ratings and two paid men were introduced into the station to help the loyal men, and the full supply was maintained without trouble of any kind. The Electricity Committee has agreed to pay bonuses to the total value of £368 to the men who remained loyal.

At the commencement of the strike all the men came out at Hackney; volunteers and naval ratings were drafted into the station, and the supply was maintained without trouble of any kind. In accordance with the Council's arrangements the works now constitutes an "open shop," and is to a very large extent restaffed with new men.

A few men at the Leeds undertaking ceased work on May 4th, but most of these returned the next day. On May 12th the majority of the men came out, but all the men were back at work by the 14th. The technical staff carried on without any outside help.

Thirty-three men of the Maidstone undertaking ceased work on the first day of the stoppage. On May 12th a deputation of the men told the chief engineer that they were tired of the strike and would like to return to work. A refusal of the Fulham Council to agree to the cutting-off of the electricity supply to some 54 consumers led to the cessation of work by the men, and the shutting down of the station. Three men who took part in stopping the plant have since been arrested and charged under the emergency regulations. At Stoke Newington the majority of the men came out at the beginning of the strike but the sub-station attendants returned to work on May 8th.

At several of the undertakings in the No. 5 (West Midlands) District the men ceased work, but the supplies were maintained with the help of volunteers.

West Ham reports that some of the men were out, the supply being maintained by the remainder without any outside assistance.

The men at the Valley Road Works, Bradford, ceased work as the result of the running of tramcars, but those employed at the Bolton Road works refused to follow suit, and passed the following resolution:— "That the employés at the Bolton Road electricity works disassociate themselves from the Trades Union Council in their action in calling a strike."

In two instances Government intervention resulted in the undertakings being taken out of the hands of the respective authorities. At Gravesend the entire personnel of the station left their posts, and the undertaking was taken over by the naval authorities. As the result of what appeared to be intimidation towards the staff at St. Helens by the local authority, the undertaking was placed under the control of the District Joint Board, No. 3, North-Western Area, under the instructions of the Civil Commissioner, N.W. Division. It is believed that it was the intention of the authority of the undertaking to replace the staff engineers by selected members of one of the electrical manual workers' unions. The men at Portsmouth, Great Yarmouth, and Lowestoft were out for a few days, returning before the strike was called off. At Stepney it was decided, apparently by the Authority, in spite of instructions to the contrary from the T.U.C., that the supply should be maintained only from dusk till dawn. It is reported that certain consumers whose electricity supply was cut off are considering the advisability of taking legal action against the Council. There was a shut-down at St.

Pancras on the second day of the strike. Some of the workers at this undertaking ceased work, but sufficient remained loyal to the undertaking to get going again quickly and maintain supplies for the rest of the period. The men at Rotherham remained at work as the result of an arrangement with the E.P.E.A. members not to supply the tramways. The members of the Enginemen and Firemen's Union were called out at Wallasey, but the supply was maintained with the help of voluntary labour. At Gloucester some of the men came out at first, but returned soon as the result of an agreement being reached on "essential supplies." It is interesting to note that all the men of the West Gloucestershire Power Co., Ltd., which had no hitch of any description, are members of the Electricity Supply Workers' National Association. All the industrial load at Erith was cut off on May 4th. At Weymouth threats to withdraw the men were rescinded after arrangements regarding electricity supplies to the docks had been arrived at. The Battersea station was run in accordance with the wishes of the Trade Union Council. The men at the Prescot undertaking ceased work, but the town was supplied by means of the bulk supply from Liverpool. Seven per cent. of the men of the Newcastle & District Electric Lighting Co., Ltd., were out for one day only. Believing that its action in calling out the stokers and enginemen at Ipswich had effectively closed down the power station, the local strike committee sent the following communication to the chief engineer:—"I have been instructed in so far as our members are concerned to offer to supply light and power for such services as houses, streets, shop lighting, social services, power for bakeries, laundries, and domestic purposes."

On the eve of the general strike the Executive of the E.P.E.A. passed the following resolutions:—

(1) That the essential public services in connection with the supply of electrical energy should be maintained.

(2) The Association deprecates the introduction of volunteer workers in the electricity supply industry, but in the present emergency this Executive Committee agrees that to maintain the essential public services it hereby instructs its members to co-operate in the Government scheme for the maintenance of such services.

(3) That to prevent a situation arising which may operate to the detriment of the foregoing resolutions, it is advisable for instructions to be given by His Majesty's Government to all electricity supply undertakers that to maintain the supply of energy for such essential public services, care shall be exercised that a supply of power shall not be given to an industrial works engaged in work of a non-essential character.

(4) That the afore-mentioned resolutions be officially communicated to His Majesty's Government at the earliest opportunity, and that copies of such resolutions be sent to the National Joint Board and all the District Joint Boards.

It was on the basis of the above resolutions that working arrangements were made possible in many undertakings, although, as was to be expected, numerous difficulties arose in defining what were "essential services." In spite of the conflicting instructions which appear to have been issued to the men by the various unions, union formations, local union branches and strike committees, much was done in the way of bringing about working arrangements between the staff and the men by conferences between the parties concerned in the local undertakings. It is interesting to note from the following letter received by the secretary of the E.P.E.A. from the Ministry of Transport, that the efforts of the staff during the time of trouble were much appreciated in official quarters:—

Ministry of Transport.
6, Whitehall Gardens, S.W.1.

Dear Sir, May 11th, 1926.

I am directed by His Majesty's Government to ask you to inform the members of your Association that their action in remaining at their several posts in generating stations and in maintaining the supply of electricity has been of the greatest possible value in the present national emergency, and the Government trust that the Association will continue their splendid work in the interests of the community.

Yours truly,
(signed) WILFRID ASHLEY.

In a report to his committee by the chief engineer at Cardiff, where most of the men were out during the greater part of the strike, he said: "It has to be borne in mind that the technical staff, in bearing as they did the brunt of the work involved, displayed their keen appreciation of their obligations to the community they serve, and what must be the feeling of the Committee, to maintain all supplies under all circumstances.

I cannot speak too highly of their devotion to duty, the cheerfulness and comradeship shown under adverse circumstances and unaccustomed duties, and I am sure their efforts deserve, and will receive, full appreciation of the Committee, Council, and citizens."

Another instance of appreciation by the local authorities of the loyalty of the power-station men was at Plymouth, where, at the conclusion of the strike, the Mayor, accompanied by the chairman of the Electricity Committee, Alderman J. B. Love, and the electrical engineer, Mr. E. G. Okell, visited the power stations at Prince Rock, Newport Street, Stonehouse, and Armada Street, to thank personally the 150 employés who resisted all the efforts made to induce them to cease work. The Mayor expressed the gratitude of the public to the men for standing by so loyally during the strike. The employés received the Mayor with cheers and every demonstration of loyalty to the undertaking and to the country. One of them remarked, "We stayed on not because we thought we were going to get anything out of it, but because it was the right and proper thing to do. We are honest men, and when we make agreements we are not going to be drawn by the nose by any Bolshevist agitators." At a meeting of the men at the Horseferry Road Station of the Westminster Electric Supply Corporation, Lord Wargrave (the chairman), on behalf of the directors and shareholders, expressed his warm thanks and appreciation for the loyalty and devotion to the company which the staff had displayed during the national crisis. He concluded as follows:—

"While expressing our sincere thanks, I wish you to accept, as a mark of our gratitude, a sum of over £2,000 as a gratuity, divided as follows:— Engineers £25 each, foremen £10, men £5, youths £2 10s."

As already indicated, in many places the clerical and administration staffs joined forces with the technical workers and became stokers, trimmers, "greasers," and the like. This was the position at Croydon, where the clerks handled some 50-60 tons of coal per day.

Amidst the hardships and difficulties that were met and overcome by those who "carried on," and in spite of the great seriousness of maintaining the electricity supply throughout the country in such a crisis, much food for subsequent reflection was found in the lighter side, particularly by those who were performing unaccustomed duties and others who were living at their work. The following is a copy of one of the many curious and amusing "station orders" which were posted up in various undertakings during the strike:—

May 11th, 1926.

A cordial invitation is extended to all members of the staff not actively engaged on shift duties to-morrow, Thursday and Friday mornings, 12th, 13th, and 14th inst., to join a party at 8.30 a.m.

The venue will be No. 17 boiler, and it is anticipated that an enjoyable time will be spent in clearing the boiler tubes and superheater tubes, &c., of dust.

Dress optional. ENGINEER AND MANAGER.

The following is an impression of the 11-days' strike from the point of view of the volunteers on sub-station work:—

**The Volunteer and the Sub-Station.**

By L. S. R.

This article is written specially for the ELECTRICAL REVIEW, because it is a review of an electrical disturbance that took place between May 3rd and May 14th.

1926. It began by the receipt of a memo. headed "National Emergency," which contained a warning to "stand by and await further instructions." The following morning our usually quiet road was thrown into a state of excitement by the roar of a sports model "Bentley" labelled O.H.M.S., which pulled up with a jerk at our domicile and pitched out the latest thing in plus-sevens (plus fours is too modest a description). Hastily thrusting a missive into my startled better-half's hands, plus-seven disappeared with another roar, in a trail of lubricating-oil haze. The missive contained the "further instructions"—report at once to U.R. —— Street sub-station. The writer having already departed for the office, the instructions were 'phoned through. Acting as directed, and knowing something of sub-stations, I dashed off to ——— Street, *via* home, where I shed the spats of respectability for the spots on the oldest togs I could find. At ——— Street all was bustle and animation. Scores of fellows were there, each eager to perform his allotted task, whilst it was yet day. A genial official entered up our names and assured us, contrary to our own beliefs, that there was positively nothing we did not know about sub-stations. Leaving him, we descended into the "sub" itself, which was being used as "H.Q. rapid-training centre." Another official—a real stout fellow this, who had already done 48 hours on duty—explained the general lay-out of the board and plant, leaving auxiliary circuits to be worried out by ourselves at the station to which we found ourselves allotted. A 10-minutes' course on starting up the station, synchronising, paralleling, &c., ensued, and then the command, "Let me see you do it." Lord! it was 17 years since I'd synchronised anything, but with a whirling brain and a trust in that little god whose especial care is toddling children and sub-station engineers, I started up. Snap! and, marvel of marvels, those rotaries dropped into step like lovers going for a country walk. Again the voice of our instructor, "right Mr. So and So—these men to report at once to ——— hurry up—car waiting." A blanket was pushed into our hands, and we were off.

At ——— Street, our home for the next eleven days, the lay-out was similar to the station we had left, so we settled down to find out how the 10,500 volts that came into the station found their way out again. As night drew on we tossed to decide who should take night shift. Two of us had all the luck, so, taking our blankets, we wedged ourselves in between the bedplates of two rotaries for our night's rest—unbroken save for the continual row of compressors, Klaxon alarms and gongs.

In the morning I found myself suffering from an acute attack of lumbago—this diagnosis proved, however, to be incorrect. My comrade and bed-fellow had shoved me hard against the makers' name embossed on the bedplate, and the letters B.T.-H. were clearly defined on that portion of the anatomy where one's back changes its name. This was particularly galling to a M.-V. man, but no doubt some B.T.-H. volunteer in another station was similarly stamped "M.-V."

With the morning came also a nice little sack of rations, labelled "One ration for one day for four men." At this point I want to take off my cloak for the lady to walk on who thought those rations out. Everything the U.R. people could provide to make us happy had been provided. A veritable bran-tub of little necessaries in neat packages. Nothing had been forgotten, even bottled beer, cigarettes, and chocolates were there, and what's more, one of our fellows was a teetotaller and non-smoker, so we other three were in luck. Each day the ration was varied—we never expected new-laid eggs—had we anticipated their inclusion, we should never have emptied out anyhow our first rations on the hard floor.

After a breakfast of bacon—minus eggs—we had a call from the Sanitary Authorities, together with a motor lorry with "England collects the ashes" painted on its sides. Six under-grads dismounted. Might they have the privilege of removing such objectionable matter as was contained in our receptacles for the accommodation of refuse? After assuring ourselves that they would endeavour not to scratch the bins and would restore them to the pavement without the accompaniment of that horrible crash one associates with their professional brethren, the privilege was accorded. Oxford and Cambridge bowed—we bowed. Oxford and Cambridge removed their head-gear—we lifted ours in response, and with a "cheerio, chaps" the combined Universities moved off in search of other dust-bins.

And so day followed day, each with its amusing experience. We "bust" nothing, we fed, we washed up, we cleaned up. From the door we revelled in the wit displayed on the sides of the motor-'buses by our fellow volunteers. Didn't the girls have a good time! At sunrise we entertained less fortunate volunteers and "specials" to early-morning tea (we mention "specials" only, as the regular police don't drink tea). In the evening we slipped out for half-an-hour to a friend's flat and enjoyed the luxury of a real settee, and a whisky and soda such as only a friend pours out. We fixed up a wireless set for news, and if some of us "nodded," the ones who kept awake told them the news afterwards.

The chief thing was that on the top of the underlying seriousness of the whole business everybody laughed. A few people had challenged the many, and the many, not immoderately but quietly, laughed. On the first day of the strike, instead of tears there was seriousness—yes! but also laughter. Nothing can survive laughter, not even a strike committee.

Well, it's all over now. We've chucked up our temporary sub-station duties—handed over again with a cheerio to the fellows who went out and came back. Reported "off" at ——— Street, said good-bye to everyone, and each received a delightful little note from Lord Ashfield, which concludes: "We shall never forget our association with you during a great national emergency, and hope that you may carry with you a pleasant recollection of the time spent with us." Sir, we most certainly shall. And now for a hot bath, clean undies, and a good sleep, for to-morrow we must put some more soot round those lettuces to kill those damned slugs.

# Transformer Oil and its Treatment.

## The Importance of Precautions against Contamination.

By A. D. JUKES.

Those who are interested in, and have a working knowledge of, insulating oils know that in the last seven or eight years vast strides have been made in this particular industry. This is primarily due to the efforts of the various oil companies which have made a speciality of transformer and switch oils, and to the firm stand taken by the British Engineering Standards Association.

Before the war the best grades of white, non-sludging transformer oil were produced in Germany, from Russian crude, and after a time a fairly large demand was created in this country. When the war broke out,

this source of supply was cut off, and users of insulating oil were forced to make the best of a bad job and take what they could get. This resulted in a great deal of oil of inferior quality being put in circulation. In fairness, however, it must be said that some of this oil stood up very well indeed under actual working conditions. In one case, a certain oil, which to-day would not pass standard requirements, was in continuous use in transformers from 1915 to 1922, approximately seven years, before it began to sludge badly. It may be assumed that some of this oil is still in use, but it now requires filtering about every seven months. This is not a bad record for an oil which to-day would not come up to the British Engineering Standards specification for Class B.

When the war ended, progressive oil firms began to look round for a good white, non-sludging transformer oil, and as no Russian oil was available, another source of supply was sought. In due course certain companies in the United States were prevailed upon to make an oil of this nature. Their enterprise was rewarded. Various firms in this country preached the gospel of non-sludging oil assiduously; before very long this grade of oil was very much in demand, and an increasing market was assured. It may be safely assumed that at least 90 per cent. of the transformers manufactured in this country to-day are put in operation on white, non-sludging transformer oil of American origin.

In the last couple of years other refiners in America have commenced the manufacture of a somewhat similar oil, and this, coupled with the fact that Russian oil is once more available, has brought the price down considerably. At the present time none of this white, non-sludging oil is actually manufactured in this country, but there are rumours that this is a possibility of the not far-distant future.

Under present conditions, transformer oil is supplied by the refiner, and is guaranteed to meet a definite specification, apart from the dielectric strength. It is then taken in hand by the oil merchants, dried, cleaned, and barrelled. This seems a very simple procedure, but a peep behind the scenes will be enlightening.

When a consignment of transformer oil is received in this country, samples are drawn off and submitted to a laboratory test to determine if it conforms to the guaranteed specification. As the cost of each of these tests is in the neighbourhood of three guineas, it will be realised that the expense to a firm which disposes of from six to twelve thousand barrels per annum is no small matter. When these tests are found to be satisfactory, the oil is cleaned and dried, and a dielectric test is taken on each and every barrel. If the test results are approved, the oil is then considered ready for shipment. Some firms—those which specialise in insulating oils—are not content with this alone. They allow the oil to stand in sealed barrels for a period of 48 hours, and if the oil, after that time, has a dielectric strength of less than 40,000 volts, it is returned to stock and re-treated. This is a very sound procedure, and if it were adopted by all transformer oil merchants there would be fewer failures. There are rumours that some firms do not take the trouble to treat oil for moisture, &c. If this is a fact, they are certainly asking for trouble, and should not be surprised when it comes.

There are various methods in use to-day for the cleaning and drying of transformer and switch oil, but undoubtedly the most popular and most satisfactory means is the centrifuge. There are about half-a-dozen firms manufacturing centrifugal machines for the treatment of oil; of these, the De Laval Company are the pioneers. One of the machines in use to-day by various oil companies, manufactured by this firm, has a capacity for treating from six to eight hundred gallons of cold transformer oil per hour. This means that it is possible to dry and clean approximately eight hundred gallons of transformer oil in its natural state per hour, and to give it a dielectric strength after one treatment, of over 50,000 volts—a very satisfactory result indeed.

It is absolutely essential to make a test for moisture on every barrel of transformer oil before it is put in circulation. This is of the utmost importance—notwithstanding the source of supply, the guarantees given, or the faith one may have in the supplier. If a genuine dielectric test with electrodes is not possible, a cracking test or poker test will determine whether the oil is dry. Both these tests are effective and easily carried out. For the cracking test, fill a test tube with oil and hold the base over a flame until a faint vapour arises from the oil; if there is moisture present, a cracking noise will be heard. It is generally found that where there is a very faint cracking, the oil will have a true dielectric strength of approximately 15,000 volts. If a fairly pronounced cracking is heard, the oil will probably have a strength of about 5,000 volts or under. The poker test is carried out by heating an ordinary poker or similar instrument to a red heat, allowing it to cool black, and placing it in a beaker of oil. If the oil is wet, the same cracking noise will be heard. Of course, these tests are not reliable where the oil is dirty, but dry. Obviously, dirty oil should not be put into transformers or switches.

It is an undoubted fact that most oil failures, due to moisture and dirt, are caused by the barrels. Cases have been known where oil has been treated and found to have a dielectric strength of 50,000 volts; yet it has depreciated to approximately 20,000 volts, after standing in the barrel for twenty-four hours. Possibly this can be accounted for by condensation, but in nine cases out of ten it is due to the condition of the barrels. In the past most oil merchants have been in the habit of charging for barrels, and crediting the customer when the barrels are returned in good condition. The barrels have then been swilled out with hot oil, drained, dried, and used again. This practice is certainly a risky one. If, for example, a barrel is emptied on site and left out in the rain, with the bung out, or loosely screwed in, moisture is certain to get in. This sets up rust. When the barrel has been cleaned and refilled, this may not be apparent, but by the time the barrel has been manhandled *en route* and tossed from railway to motor truck, the rust adhering to the inside of the barrel will have been loosened and mixed with the oil. When the oil reaches its destination, and samples are drawn for test, it is dirty and is probably condemned. This means that carriage must be paid back to the works, and a fresh consignment sent out. If there are facilities on site for re-treating the oil, and this is done, it will probably cost the vendor a penny per gallon, which will be deducted from the price. A great deal of money is lost every year by transformer oil dealers on this account.

There is no reason why transformer oil should not be shipped any distance in 18-gauge steel drums, and arrive on site in a satisfactory condition, provided that the oil has a good dielectric strength before shipment, and the barrel is not broken open, or the bung removed or loosened in transit. To achieve this result, however, new barrels must be used for each and every consignment. Transformer oil is delivered, in most cases, by the refiners in new 18-gauge steel barrels, with pressed-out rolling hoops. If the oil is cleaned, dried, and sent out in these barrels *once only*, the wet and dirty oil problem, apart from isolated cases, should be solved. There would be no need for 14-gauge steel and galvanised barrels with outside rolling hoops, and the consequent increase in freight charges. It would save the transformer oil merchants and the large consumers many pounds annually, as a 14-gauge barrel weighs approximately 50 lb. more than an 18-gauge.

In conclusion, the price of white, non-sludging transformer oil has reached a very low figure, and if the price is forced down much lower, it may result in the merchants disclaiming all responsibility for dielectric guarantees, and the cessation of the expensive methods of drying and cleaning now in vogue. If this does happen, the onus of responsibility for wet and dirty oil will rest upon the transformer manufacturer, and it will mean the purchase of expensive plant to do this work.

# International Standardisation.

## A New Standardising Body to Meet in London.

(From Our Special Correspondent in the United States.)

DURING the recent conference of the International Electro-technical Commission, held in New York, at which about a hundred delegates attended from a dozen European countries, a conference of chairmen and secretaries of various national standardising bodies was called to discuss the general question of international standardisation.

Several meetings were held under the chairmanship of Mr. C. E. Skinner, the president of the American Engineering Standards Committee; Sir Archibald Denny, the president, and Mr. de Maistre, secretary of the British Engineering Standards Association, supported by Sir Richard Glazebrook, Mr. C. P. Sparks, and Mr. Ll. B. Atkinson, represented the British interests.

About thirty representatives attended the discussions, which were restricted in the first place to the broad lines of considering the organising internationally of the collection and dissemination of information from various countries regarding the standardisation of matters, broadly engineering, not at present dealt with by any existing international organisation.

As is widely appreciated at Home, the British Engineering Standards Association makes no attempt to dictate to industry, but only undertakes standardisation on any particular line when it is clear that all the interested parties are in agreement that the step is desirable. Standardisation in other countries does not appear to proceed in such a satisfactory manner. There is a tendency abroad for the deliberations to proceed along academic lines, and for the manufacturer not to be given a full opportunity for expressing his views before the standards are formulated. Such a condition results in some of the foreign standardising bodies not being anything like so representative of the commercial interests as is the B.E.S.A., with the consequence that the standards do not always become effective.

International engineering standardisation has, of course, been in progress through various channels during the past ten or fifteen years, quite apart from official action of the I.E.C. and the B.E.S.A. There has, for example, been a move towards the standardisation of the shape and pitch of screw threads, and the dimensions of ball bearings, as well as of certain replaceable parts employed in engineering generally.

The war, with its development of mass production, gave a great impetus to standardisation, the importance of which was very fully appreciated first in America, where Mr. Hoover started his campaign of simplified practice, then in England, and later on the Continent. A short time ago a movement was set on foot between certain central European countries to standardise, amongst other things, the width across the flats of bright nuts, and it was at once felt by standardising bodies in other countries that if any decision on a subject of such universal interest could be made truly international a great step would be achieved for the common good. So far as this country is concerned, the B.E.S.A. saw that it could not afford to stand outside such a movement, but that steps would have to be taken towards forming an international body to deal with such matters before the separate national bodies had gone too far. The Americans were pressing for the question to be raised in New York while the opportunity existed of obtaining a free discussion between representatives of various nationalities, and full support was given by the representative British delegates.

It has not, of course, been found possible at these preliminary discussions to lay down any very clearly defined field of action, nor is too sudden a crystallisation of ideas in this direction desirable. Naturally, it will be some time before more than interchange of information is possible along these lines without any attempt to obtain international agreement on actual standards. In fact, the new organisation which has seen its birth in New York, to start with may be in the nature of an international technical association rather than a standardising association.

The important suggestion was made by that clear-sighted man, Doctor John W. Lieb, the vice-president of the new York Edison Co., that whatever was done in the direction of international investigation between countries should be done through one organisation, and that the experience and personnel of the I.E.C. should be made use of to the utmost possible extent. With a view to doing everything possible to further Dr. Lieb's suggestions, several conferences and conversations took place in New York between the various nationalities, and in spite of some little misgiving and only after the gravest consideration it was decided to go forward cautiously on these lines, allowing each country full liberty to discuss what it considered to be the proper method to further the work.

It was interesting to observe during the discussions that the proposals for organising this new international understanding had a strong backing from industry in the United States. This augurs well for the future of the movement, which, of course, cannot go forward without substantial financial support.

Prior to the opening of these New York conversations the British, Belgian and Dutch secretaries had co-operated in producing a draft organisation, and during the talks other countries, notably America, which had convened the conference and drawn up the agenda, contributed definite proposals.

In view of the 20 years' active and useful life of the I.E.C., during which it has been formally recognised by many Governments of the world as an existing means of interchange and promulgation, it was felt that collaboration between the new body and the old would result in a valuable saving of energy and overlapping of effort which, while leaving the I.E.C. entire liberty of action, would result in much all-round economy. It was frequently observed, too, during the discussions that with the B.E.S.A. and the I.E.C. working side by side under one general secretary, Mr. Le Maistre, has on all occasions acted internationally in the affairs of the latter body; the recognition of this fact no doubt had considerable influence with the various foreign delegates in bringing them ultimately to a decision to recommend unanimously to the national standardising bodies that the central office of the new body should be in London, and be run in intimate contact with the central office of the I.E.C.

A constituting committee of seven was appointed to receive the replies of the national standardising bodies, and this Committee will meet in London under the chairmanship of Sir Archibald Denny some time before the autumn, to take matters a step further towards setting up the machinery for actually carrying on the work.

The British delegation was ably led by Sir Archibald Denny, and throughout the discussion Sir Richard Glazebrook, who for forty years has taken such an active part in international movements, did yeoman service. The assistance rendered during difficult passages by Mr. Ll. B. Atkinson was also of the greatest value.

Indeed, the confidence and respect accorded to the British delegation when differences of opinion had to be adjusted, have added considerably to the prestige and reputation which this country enjoys in international technical fields. The British point of view has never been more adequately advanced nor has it been received with such respect, and we shall anticipate with a lively interest the growth of this technical League of Nations.

# Parliamentary News.

**[By Our Special Parliamentary Reporters.]**

**Insulation of Electric Cables.**—On May 17th Mr. DAY asked the Minister of Labour if his attention had been drawn to the death of Edward Cox, Battersea who came into contact with an uninsulated wire when working on the South London Tube extension at Trinity Road station; and, in view of the danger to workmen engaged on such undertakings, would he cause regulations to be made with a view to all electric cables being insulated.

Col. ASHLEY, who replied, said that his attention had been called to the accident. He was making certain inquiries, and proposed to consider, when these were complete, whether there was any action that he could usefully take.

**Leicestershire and Warwickshire Electric Power Bill.**—This measure was read a third time in the House of Commons on May 4th and in the House of Lords on May 14th.

**Lighting in Lanarkshire.**—On May 18th, Sir A. SPROT asked the Minister of Transport what was the present position of matters as regarded the obtaining of wayleave from certain proprietors to permit of the laying of an electric cable, the want of which was holding up the public lighting of the Salsburg district, Lanarkshire.

Col. ASHLEY said that objection had been taken to the Power Co.'s application for the wayleaves referred to, and a further inquiry, for which he hoped to make arrangements at an early date, would be necessary.

**The Broadcasting of News.**—On May 19th, Mr. DUCKWORTH asked the Postmaster-General whether he would arrange for the British Broadcasting Co. to continue permanently to broadcast part of its special service of news and comment initiated during the recent emergency.

Sir W. MITCHELL-THOMSON said that the arrangements for the distribution of news by means of the British Broadcasting Co.'s stations were governed by an agreement between the company and the Press. This agreement would expire with the termination of the present licence to the company on December 31st next, and the new broadcasting authority which it was proposed to set up would be free to make fresh arrangements.

# Correspondence.

*Correspondents should forward their communications* **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

### Strike Profiteering.

During the recent strike, we were carrying out an urgent job in North London, under difficulties, and requiring some additional material, we courteously invited a local electrical contractor of, obviously, some standing, to oblige us with these materials, explaining the difficulty in transporting goods, and offering to pay 10 per cent. over and above the usual trade prices to compensate him for his trouble.

Imagine our surprise, when we were informed that he would only supply us at prices approximately *double* those usually charged.

It would be interesting to learn if any of your readers have experienced similar cases of rank profiteering.

**Henfrey Electrical Installations,**
HY. FREEDMAN, *Proprietor.*

London, *May 18th*, 1926.

### Engineers and Labour Disputes.

Mr. Thomas Carter, in the excellent and inspiring paper which he read before the I.E.E. a few months ago, urged the need for engineers to take a greater part in public life, pointing out that it was the work of engineers in the past which had changed a simple mode of life into an extremely complex one, and therefore it was the duty of engineers to endeavour to devise some means of lubricating the industrial machine which had been built as a result of their inventions and labours

Now, while it is perfectly true that some engineers are, by their nature and training, eminently fitted for dealing with the many complex problems of modern industrial life, it is a fact that no body of men is more ignorant than engineers are regarding the history and principles of industrialism; and it is during crises such as we have just experienced that we realise the extent of the average engineer's ignorance regarding the troubles liable to occur in the industrial machine.

Here is a serious disturbance occurring on an elaborate high-tension system, and we have the unedifying spectacle of a large body of highly trained men excitedly discussing the merits and demerits of the indicating instruments, instead of attempting to acquire some knowledge of the system affected with a view to ascertaining the cause of the trouble; and, because the problem is one outside their accepted province, they fail to appreciate their illogical position.

In other words, the average engineer anathematises the trade unionist without knowing anything of trade unionism, and preaches class distinction without realising the modern tendency towards its elimination.

Presumably we are all agreed that engineering problems can only be solved satisfactorily by men well trained in engineering principles and capable of studying the various phases of those problems. Why, then, can we not be logical enough to study the fundamental principles and growth of industrial problems before accepting solutions propounded by someone possibly even more ignorant on the subject than we ourselves?

Scurrilous abuse of trade unions and employers' federations, as served up by a sensational Press, is not a scientific method of solving the complicated problems presented by the elaborate industrial machinery developed during the past two centuries; and if engineers would study the economic growth of that machinery and learn something of the troubles which have occurred during its history, they would be more capable of finding a sound solution than are those who wildly advocate the smashing of unions and the blatant recognition of the class war, with powerful corporations on one side and a disorganised rabble of free labour on the other—possibly with technical employés in the superior position of complacent neutrals.

**T. H. R.**

Rugby, *May 15th*, 1926.

[Our correspondent appears to have been upset by some occurrence which has not come to our knowledge. We do not agree with his view that engineers as a body are ignorant of the history and principles of industrialism; nor do we accept his statement that the average engineer is hostile to trade unionism and preaches class distinction. The "scurrilous abuse" that he mentions is surely imaginary.—EDS. ELEC. REV.]

### The Resistance and Heating of Lampholders.

As manufacturers of lampholders from 1882 until 1902, when we gave up their manufacture, we were naturally interested in the article on "The Resistance and Heating of Plunger-type Lampholders" which appeared on page 689 of your issue of April 30th.

The last patterns of B.C. lampholders which we made embodied this feature, and we believe that Messrs. Dorman and Smith, of Manchester, were at the same time making another pattern which contained a spring plunger device.

These improvements, introduced some 25 years ago, so far as we were concerned, did not, however, receive sufficient recognition to warrant a continuation of manufacture. Probably the reason for this was because B.C. lampholders were not called upon to carry such heavy currents as they are nowadays, when the tendency is to burden these articles with currents far in excess of those for which they were originally designed.

To meet these heavy loads, improvement in carrying capacity is, to-day, most essential, and, unfortunately, the need has arisen when the articles have become very competitive in price, the result being that slight additions in price are looked at unfavourably.

Our own pattern, a sample of which we send herewith, has spring plungers, constructed in accordance with our Patent No. 367 of 1901.

This construction, you will notice, depends upon a stud extension of the terminal, and on this a hollow four-slotted plunger slides, the inward set given to the four prongs of the plunger providing an efficient sliding contact between the terminal and the plunger, independent of the spiral spring.

In Messrs. Dorman & Smith's pattern, we believe that the plunger was solid, split in two, and sprung outwardly, sliding within a tube in a similar manner to that shown in fig. 1 (a) of the article referred to.

**A. P. Lundberg & Sons.**

London, *May 3rd*, 1926.

### Country-House Fires.

In your issue of April 23rd a gentleman, signing himself "Engineer Surveyor," says his attention had been directed to my letter, which statement I take to imply that he was writing in a representative capacity; he takes exception to my statement that "Insurance companies do not *cause* very careful tests to be made." I am willing to substitute for the word *cause* the word *insist*. The report form certainly asks for particulars which are more honoured in the breach than in their fulfilment, for the very reason, perhaps, that "Engineer Surveyor" gives, *i.e.*, the disinclination of some clients to be bothered; still, it is the duty of the trade to educate the general public to the need and prudence of inspection by independent and qualified engineers, as in the case of boilers, because you might as well be blown to atoms as be roasted alive, and the multiplication of the risks is certainly a call to action on the part of those most nearly concerned.

"Engineer Surveyor" says that objection is often taken to the inspector getting access to all points to take out lamps and test each sub-circuit. Is this necessary? If the inspector uses a little diplomacy he will usually get more latitude than is absolutely necessary.

But what I object to in "E.S.'s" letter is its general tone and cheap sneers at companies other than his own ring clique; he seems to think that I made an attack on insurance companies and their surveyors, which I did not, and I am glad that he concedes my main contention, that all installations should be compulsorily examined occasionally.

**J. Price.**

Manchester, May 5th, 1926.

### The Heating of Buried Cables—Report No. 2.

With reference to Mr. Fawssett's letter to your journal, a copy of which has been sent me by the courtesy of the Director of Research, I think Mr. Fawssett's remarks now make the matter perfectly clear.

I would, however, point out with reference to his statement that "None of the values of the thermal resistivity given in the report are affected;" that this must not be taken to mean that my statement is incorrect, *viz.*, that you get a wrong resistivity by taking Equation (25) in the form given in the I.E.E. journal.

I ought, perhaps, in explanation of my attitude, to point out that about a year and a half ago, in trying to check the values for the resistivity given in the tables published in the Institution *Journal*, I found I could in no way reconcile these (for three-core cables) with the formula. I spent the best part of a day over the matter and, owing to pressure of other work, had to give it up, thinking that I must have made some egregious mistake.

Then, perhaps a year ago, the results of an actual test on a three-core cable by a leading firm of cable makers came into my hands and I could again in no wise reconcile the temperature attained by the cable with the value of the resistivity as given in the tables published in the I.E.E. *Journal*. The possibility of Equation (25) being wrong seemed to me at that date too dreadful to contemplate, and again I had to leave the matter, after spending several hours, with the firm conclusion that something was wrong, but I did not know where. I was, in fact, on the point of writing to the cable makers to tell them that I thought there must be some mistake in the tests, but fortunately decided not to do so!

Last, about a month ago I found it necessary to return to the charge, and this time determined to get to the bottom of things, with the result that I found the discrepancy in the equations, as given in the two reports.

It is quite possible that others besides myself have been through this painful experience, and I hope, therefore, that Mr. Fawssett will not consider that I was doing him any injustice in letting the matter be known as early as possible for the benefit of saving others from falling into the same trouble.

As Mr. Melsom was always the one who replied to discussions on this question at the Institution meetings—at any rate, those discussions which I attended—I took it that he was the one who was primarily concerned in the mistake, and that is why I have not troubled Mr. Fawssett in the matter.

I hope he will exonerate me from any desire to overlook his excellent work in this connection.

**A. M. Taylor.**

Birmingham, *May 19th*, 1926.

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### Burgh of Hamilton—Electrical Engineer.

Under the above heading an advertisement appeared in the ELECTRICAL REVIEW on April 23rd, 1926. In the same issue in the "Personal" column appeared the following: "Mr. W. J. Cooper, acting electrical engineer at Hamilton Electricity Works, has been appointed electrical engineer for the Burgh of Hamilton."

Extract from the ELECTRICAL REVIEW, May 14th and 21st, 1926, "Personal" column: "We are informed that the appointment of electrical engineer for the burgh has been made by Hamilton Town Council. By 11 votes to 3 Mr. W. J. Cooper (at present acting engineer at the Hamilton Corporation Electricity Works) has been appointed."

Why did they ask for nine copies of testimonials when one would have been sufficient?

**Curious.**

*May 21st*, 1926.

[As stated in our issue of April 30th, p. 706, the announcement in our "Personal Column" on April 23rd was premature.—EDS. ELEC. REV.]

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### Electricity Meters.

In your leaderette on "Electricity Meters" you give the impression that meters generally tend to go slow rather than fast, but, particularly on the alternating-current meters, there is a possibility that many of them may run fast after a certain period of service owing to the instability of the magnets.

There is no doubt that during the war, and even prior to and since the war, there were many makers of magnetic steel in this town who understood very little about the essential properties of magnets, not only as to how essential it was that the magnets should be stable, but as to how to make them stable. Some of the firms which were supplying magnetic steel had not even got the apparatus for testing it; and some did not magnetise the steel and had a most rudimentary idea as to how it should be done. Fortunately there were some makers who employed fully qualified people to advise them, and these remarks only emphasise the absolute necessity of having proper testing equipment and testing service for all consumers' meters.

I am, personally, of the opinion that meters should not be allowed to be out more than from three to five years without a thorough overhauling and testing, yet it is safe to say that over 50 per cent. of the meters in the country are not looked at oftener than once in ten years. In many cases, the practice is to look at a meter only when it has stopped, or when the consumer has left the premises and there is no chance of current being used for some time.

More up-to-date towns have a systematic testing and overhauling of meters whether they want it or not.

**Permanence.**

Sheffield, *May 21st*, 1926.

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## Reviews.

**Electrical Circuits and Machinery** (Vol. III, Experiments). By J. H. MORECROFT and F. W. HEHRE, Columbia University. Pp. viii + 165; figs. 83. London: Chapman and Hall, Ltd. Price, 10s. net.

The present work completes a series of three books by these well-known American authors, the others having been concerned with the theory of direct and alternating currents respectively. It is intended as a laboratory guide for students who are primarily concerned with a branch of engineering other than electrical and who have but a limited time available for practical electrical work. The authors suggest that the experiments described can be performed by devoting one period per week for one session (which should be allocated to one of the later years of the course taken by the students) to the work, but it seems probable that rather more time would be necessary to obtain the most effective results.

The experiments included in the book are, for the most part, concerned with machines (both direct and alternating current types being considered) and special attention is devoted to the operating characteristics of the appliances under consideration, a method which can be well commended when instructing students of the type mentioned. Of special interest are the descriptions of certain tests in which use is made of a telephone as the indicating instrument in connection with the localisation of earths in armatures and with the determination of the wave form of alternators. A noteworthy omission is the absence of any material relating to temperature rise tests on machines, surely an important matter for the class of engineers for whom the book caters, and an account of a form of Hopkinson test would also be a useful addition.

The chief criticism that we wish to make is in regard to the poor heading of some of the columns in the blank forms for test results. It is important, when recording results, that the name of the quantity and the name of the unit should be expressly indicated in connection with each number booked, but in this work we sometimes find columns headed with the name of the quantity, sometimes with the name of the unit and rarely do we find both pieces of information included.

The authors understand the requirements of students and appreciate the points needing particular stress and this is very clearly shown in the collection of interesting questions, usually qualitative, at the end of each section. It is only possible to obtain the maximum value out of a book dealing with experimental work if the instructor in charge of the class takes pains to amplify the necessarily general information given in the book with detailed help in regard to the particular machines and appliances used in his laboratory, and, if such instruction is efficiently conveyed, we can heartily recommend the volume under notice.

In a list of other works by the same authors we notice that not only are the numbers of pages and figures mentioned but also the dimensions of the pages in *inches*, this seems quite a useful piece of information and might be more generally included. The idea of re-commencing the numbering of the figures in the second part of the book (dealing with alternating current work) cannot be commended and seems likely to lead to confusion.

**A Treatise on Electricity.** By F. B. PIDDUCK. Second Edition. Pp. xiv + 684; figs. 385. London: Cambridge University Press. Price, 21s. net.

This is a text book for honours students of physics and the whole of the very wide field now included in the science of electricity is very adequately covered. The book opens with a brief mathematical introduction dealing with vectors and leading up to Stokes's Theorem and Laplace's Operator. A note on Bessell's Functions is also included in this section.

Permanent magnetism, electrostatics and electric currents are dealt with in successive chapters, and then follow chapters on magnetic effects of currents, thermo-electricity, induced magnetism and induction of currents. All these are sound solid stuff upon which the student may confidently build up his knowledge of either the pure or applied branches of electricity. In view of the essentially mathematical and theoretical nature of the general treatment of the whole subject there is little or no justification for the inclusion of a chapter on applied electricity, and, indeed, it is difficult to find in what respect this chapter is more "applied" than any of the others, for surely a triode valve is no less an application of electricity than is a dynamo or an arc-lamp.

The chapter designated applied electricity really deals with electromagnetic machines, and this is followed by a section on electrolysis. In these chapters the author ably elaborates the outcome both in theory and practice of Faraday's two mighty discoveries: the electromagnetic effect and the laws of

electrolysis. In fact, we may look upon the first ten chapters of the book as covering the ground mapped out by Faraday; the second half of the volume deals with the new territory which has been opened up to us during the last fifty years.

This new territory is explored very thoroughly in five excellent chapters on electric oscillations, electricity in gases, Röntgen rays, radioactivity, and the electrical theory of matter. The first of these, commencing with the theory of condenser discharge and the production of electrical oscillations, proceeds to the experiments of Hertz and then treats of the thermionic valve and the subsequent development of modern wireless communication.

The section on electricity in gases is a concise and authoritative account of this subject from the early experiments of Crookes to the modern work of Aston and Rutherford, and the only fault the reviewer would find is in the somewhat scanty treatment of Sir J. J. Thomson's early classical work on the nature and properties of the electron. Radioactivity and the theory of the nuclear electronic atom are dealt with in the last chapters, and the latter subject has been brought up to date so as to include the most recent developments of the Bohr-Rutherford theory.

The book is well produced and has an exceedingly complete index. Its broad and thorough treatment of the established facts and the new theories of electrical science will assure for it a place among the standard works on the subject.

P.H.S.K.

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**National Economics for Britain's Day of Need: The Solution of the Unemployment Problem.** By EDWARD BATTEN, M.I.Mech.E. Pp. xi + 217. London: Sir Isaac Pitman & Sons, Ltd. Price, 5s. net.

The book has been written out of the conviction that although war and destruction compel poverty and want, it is only the feeble and the foolish who can accept and believe the proposition that our idleness is as compulsory as our destitution. The author works along the lines that the problem to be solved is one of liabilities and assets with regard to the rationing of the people, and compares the rival systems of production, competitive or individual, and non-competitive or socialist. Much food for thought in connection with our modern national problems is contained in the chapters criticising and comparing the different political aspects of them, and in this direction the chapter on "Foreign Trade Regulation by a Socialist State" is particularly interesting. The author visualises the trade relationship between Socialist Britain and a protected country. Chapters on the influence of tariffs, preferential trading and selective tariffs, dwell much on modern politics, while "Money and the Gold Standard" and "Inflation and Deflation," are chapters which will be read with much interest by speculative and business men. The appropriate remedy for the injurious effects on British trade of the monetary policies of foreign countries, says the author, is to be found in our own wise monetary regulation. "The solution of the problem is the adjustment of the internal purchasing power of domestic money to constant parity with the external selling price in gold of the exported products of national industry."

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**Radio and High-Frequency Currents.** By E. T. LARNER. Second Edition, enlarged. Pp. vii + 61; figs. 25. London: Crosby, Lockwood & Son. Price, 2s. 6d. net.

This little manual gives a concise outline of the general principles of radio-telegraphy, and this edition includes also a chaper on radio-telephone transmitters.

It is especially suitable for students and amateur radio experimenters who have an elementary knowledge of mathematics and the principles of electricity, and who are desirous of obtaining a clear grasp of the general methods by which radio messages are sent and received.

It would be a mistake in a book of this size to attempt anything outside the barest fundamental principles, and Mr. Larner does not commit this error.

Short wave working is not touched on at all, but on page 2 the sentence "For short ranges short waves are used, whereas long waves are required for transmission over long distances," should have been omitted in this revision.

The information given is clear, concise and well arranged, and the book should fulfil well the purpose for which it was written.

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# Business Notes.

## Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

**Sic Transit.**—We know not whether to congratulate our esteemed contemporary, the *Electrician*, upon its determination to "miss publication entirely" during the recent emergency, or whether our congratulations should be offered to the electrical industry. The Editor makes no apology—far from it! He appears to be proud of the fact that at last, for the first time in his journal's long history—which, of course, means since it was born in 1878—two weeks passed without the proprietors being able to issue "some sort of a sheet." As for ourselves we supposed that the national policy was to carry on and to keep smiling—to shut down entirely were easy for any of us—so we struggled during a fortnight with all sorts of difficulties and did our best to keep the electrical profession and industry informed through the medium of a weekly Electrical Bulletin which meant hard work and considerable expense. We *did* try, but now, alas, must we feel that we have done the thing that we ought not to have done. Truly there is no health in us! Anyhow, we have the satisfaction of knowing first that our efforts were appreciated, and secondly, that our records were kept up to date by the presentation of the Special Supplement with our last issue.

**E.D.A. Activities.**—We have received from the British Electrical Development Association a selection of publications—old and new—touching upon many phases of the use of electricity. The principal of these is a brochure describing, with illustrations, the Electric House at Olympia, with its contrasts of Mid-Victorian and neo-Georgian methods. Another useful pamphlet contains an article on salesmanship by Mr. V. W. Dale. In addition to these there are illustrated leaflets dealing with the ease of electric washing and cooking, and the comfort and cleanliness of electric lighting and heating.

**Unemployment.**—One serious effect of the coal mining dispute and the general strike has been a considerable increase in the number of persons registered at the Employment Exchanges. At May 10th the total was 1,576,000, as compared with 1,105,000 on May 3rd—an increase of 470,000.

**Australian Tariff Amendments.**—The new Commonwealth Customs Tariff, which has been passed by the House of Representatives, but not yet ratified by the Senate, provides, *inter alia*, that coal-cutting machines shall be admitted free of duty under the British preferential tariff; the duty under the intermediate tariff is 5 per cent., and under the general tariff 10 per cent. The rates for X-ray transformer apparatus, other than that designed exclusively for deep therapy, are, respectively, free, 10 per cent., and 20 per cent., but on and after July 1st, 1926, the rates are to be increased to 27½ per cent., 35 per cent., and 40 per cent.

**The British Industries Fair, 1927.**—Activities in connection with next year's British Industries Fair have commenced somewhat earlier than usual and we have already received the preliminary prospectus of the Birmingham section. This states that the Birmingham Fair will be held at Castle Bromwich Aerodrome from February 21st to March 4th, and the buildings are being considerably enlarged, giving a total floor area of nearly 200,000 sq. ft. The reduced price for space which was instituted this year is to be maintained and for an overall charge of £10 a "counter display" can be arranged and maintained by the Fair authorities for any exhibitor who has only samples to show and does not wish to employ attendants, although, of course, representatives can be placed in charge if desired. Arrangements are being made to keep visitors to previous Fairs fully acquainted with what is going on. As in previous years the exhibits are classified in eleven groups and although electricity is not one of them, we anticipate another good electrical display. Mr. T. R. Martin (J. H. Tucker & Co.) has been appointed chairman of the Fair Management Committee.

**Swedish Electrical Exports.**—The official foreign trade returns show that during 1925 Sweden exported electrical generators to the value of 21,000,000 kr. (£1,155,730), as compared with 17,492,000 kr. (£962,680) in 1924. The exports of telephone and telegraph apparatus were valued at 7,006,000 kr. (£385,580). as against 7,519,000 kr. (£413,810) in 1924.

**Belgian Company's Developments.**—At the annual meeting of the Société des Ateliers de Constructions Electriques de Charleroi, recently, the chairman stated that arrangements had been completed for the production of a new series of up-to-date electrical machines, and that in the company's cable factory, plant had been installed for the manufacture of long-distance telephone cables.

**The F.B.I. and the French Debt.**—In a letter to the Chancellor of the Exchequer, the Federation of British Industries states that French industry is enjoying very substantial advantages in competition with British Industry by reason of the heavy subsidy in relief of French taxation which is involved by the payment of interest on the French debt by British taxpayers. In addition, the sale of competitive French products is aided by the depreciation of the French currency and the high import tariffs which have been instituted. In these circumstances the Federation says that no settlement with France will be regarded as satisfactory which does not take these factors into account, and it is hoped that any settlement will provide for substantial annual payments in respect of the debt, for the stabilisation of the finance and currency of France, and for some relaxation of the French tariff policy.

**Power Companies and the Sale of Appliances.**—In its May issue *The Electragist*, the official organ of the American contractors and contractor-dealers ("Electragists") criticised the American supply companies' sales policy on several counts. In the first place the wisdom of selling appliances by instalment payments spread over as long as two years is questioned. This practice is also condemned as being inimical to the interests of electrical dealers; it is said that only department stores, which will not "service" appliances, can compete on these terms. The companies' contention that they must sell appliances to absorb their power is considered ridiculous, as it is alleged that their activities result mainly in the sale of washing machines, vacuum cleaners and other appliances which consume practically no energy. Figures prepared by a typical company are reproduced showing that the appliances of this nature represented 48 per cent. of the sales; 32 per cent. was accounted for by the sale of installations, while only 20 per cent. was due to the sale of cookers, refrigerators, signs, and other devices which consumed a larger amount of energy. *The Electragist* says: "A utility is first and foremost a manufacturer and distributor of electric energy. It is entitled to build its load and develop its service. . . . The public is entitled to the widest use of energy at the minimum rate. If a utility makes it difficult for other retailers to compete except with inferior articles, the public is not being served in the manner to which it is entitled. If this aggressive policy results in a mechandising loss, such loss is capitalised and the public penalised. And if the loss so incurred is not absorbed by the profit on the energy revenue from the sale, then the public is victimised."

**New Municipal Showrooms and Offices.**—The Ilkley Urban District Council has applied to the Electricity Commissioners for sanction to a loan of £5,500 for the erection of offices and showrooms for the Electricity Department.

**"Ediswan" News Bulletins.**—During the General Strike when news was hard to obtain, the Edison Swan Electric Co., Ltd., rendered a real public service by reproducing the bulletins which were broadcast by the B.B.C. and distributing copies gratis over a wide area of London. The company had the special permission of the authorities to perform this service, and it was actively assisted in the distribution of the bulletins by the managements of theatres, kinemas, hotels, clubs and business houses. The accompanying picture shows the commencement of the distribution of the final issue of the "Ediswan News Bulletin." The company also made special arrangements for the distribution of its radio products during the emergency, special supply bases having been arranged in advance at Birmingham, Liverpool and Newcastle.

**The "Ediswan News Bulletin" being distributed.**

**South African Customs Duties.**—The *Board of Trade Journal* publishes a list of proposed amendments to the Customs Tariff of the Union of South Africa. The list includes "machinery for the conversion and transformation of electric power" upon which it is proposed to raise the maximum duty to 5 per cent. *ad valorem*. Batteries (primary and secondary) are to be subject to higher rates, including 12 per cent. upon batteries for radio purposes, 15 per cent. for automobile batteries, and 10 per cent. for other types, plus a suspended duty of 15 per cent. *ad valorem*. It is proposed to admit welding electrodes free of duty; at present they are only admitted free upon certain conditions.

**Hungarian Tariff Reduction.**—With the object of encouraging the development of the motor industry in the country, the Hungarian Government has temporarily reduced the import duty on electrical ignition, starting, and lighting equipment, without storage batteries and lamps, to one-tenth of the scheduled tariff.

**Catalogues Wanted.**—MR. J. D. BRYAN, electrical contractor, who has removed to 513, St. Vincent Street, Glasgow, C.3, wishes to receive catalogues and lists.

**Irish Free State Electrical Imports.**—The imports of electrical goods, excluding machinery, into the Irish Free State during March last were valued at £38,065, as compared with £26,997 in March, 1925. The imports for the first quarter of the current year are officially returned at £129,187, as against £73,404 in the corresponding period of 1925.

**Contractors Visit Lamp Works.**—Over 70 members of the Electrical Contractors' Association from Nottingham, Leicester and Birmingham were the guests of the General Electric Co., Ltd., in London on April 29th. They were conveyed in parties on arrival to the Osram-G.E.C. lamp works, where many interesting processes were inspected in lamp and valve manufacture. After luncheon the visitors were taken to the Wembley glass works, where they saw glass tubing being made for the Osram Lamp Works, and bulb blowing by automatic machinery. A tour was then made of the research laboratories of the company, where guides explained the nature of the work being carried out.

**Swedish Turbines for Japan.**—*Swedish Export* says that the Kristinehamm Works of the Karlstad Engineering Co. has recently received an order for three high-pressure water turbines to be installed in Japan. The aggregate capacity of the turbines is 60,000 h.p. This contract has been received after severe competition with the most prominent turbine builders abroad. The firm has already installed turbines at many of the Japanese hydro-electric works.

**Trade Announcements.**—The annual staff outing of the LONDON ELECTRIC WIRE CO. & SMITHS, LTD., has been arranged for June 5th, and the head office at Golden Lane, E.C.1, will be closed on that day. A small staff will, however, be in attendance during the morning to deal with urgent matters.

The SUFFOLK IRON FOUNDRY (1920), LTD., has appointed the British Oxygen Co. sole selling agents for its "Ferro-Silicon," "Super-Silicon," and "Sifbronze" welding rods. The agency will include Great Britain, Northern Ireland, Irish Free State, India, Australia, and New Zealand.

THE AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., states that its Liverpool registered telegraphic address is now "Strowger, Liverpool"; and telegrams to its London office, Norfolk Street, Strand, W.C.2, should be addressed: "Strowger Estrand London."

The radio apparatus manufactured by MESSRS. C. A. VANDERVELL is stocked at Shaftesbury Avenue, W.1, Newcastle-on-Tyne, Birmingham and Glasgow by Messrs. Joseph Lucas, Ltd., and at Leeds and Bristol by Rotax (Motor Accessories), Ltd.

MESSRS. ALEX. BROWN & Co. have removed to 113, West Regent Street, Glasgow.

**Catalogues and Lists.**—MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Leaflet 36E, containing details and prices of power bells and accessories, and Leaflet 57C, dealing with electric-motor sirens.

AUTOVEYORS, LTD., 84, Victoria Street, S.W.1.—A priced and illustrated leaflet describing the company's "thermionic relay."

MESSRS. L. MCMICHAEL, LTD., Wexham Road, Slough.—Two illustrated and priced pamphlets dealing, respectively, with the company's 7-valve supersonic receiver and a vernier condenser dial.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for May, containing descriptive articles and notes relating principally to "Osram" lamps and valves. Also a priced and illustrated catalogue and a folder advertising "Freezor" fans.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—A folder advertising the "Universal" electric curling iron.

DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, S.W.1.—A brochure containing a simple detailed description of the "Delco-Remy" coil ignition system. Illustrated.

THE HART ACCUMULATOR CO., LTD., Stratford, E.15.—A coloured showcard advertising "Hart" batteries for radio, automobiles, lighting, &c.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, S.W.1.—A card advertising the company's time switches, with a topical allusion.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—A general descriptive catalogue containing particulars of cables, joint boxes, tramway material, welders, etc.; a catalogue of "Prescot" house fuse boxes; and leaflets dealing with the company's insulating varnishes and fault-localising apparatus.

SWITCHGEAR & COWANS, LTD., Elsinore Road, Old Trafford, Manchester.—Descriptive Section No. 27, containing illustrated particulars of single-phase and polyphase induction regulators for hand, motor-operated, or automatic voltage control. The principles, design and construction are very fully set out.

MESSRS. MARELLI & CO., LTD., 19 and 20, Garlick Hill, E.C.4.—Pamphlet L/711, illustrating and describing the company's oscillators and revolving ceiling fans.

CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4.—Twenty-four-page pamphlet entitled "All Over the World," "The Drum of Empire"—a Callender drum, of course. It contains some notes on the building up and development of the company's business, accompanied by a series of pictures of many places in different parts of the world where their cables are in service.

MESSRS. E. BROOK, LTD., Empress Works, Huddersfield.—A folder advertising "Brook" induction motors.

MESSRS. MCCORMICK & BUTLER, 121, Victoria Street, S.W.1.—Two folders advertising the firm's "Indurite" moulding powder and moulded products.

MESSRS. JAMES MCMILLAN & CO., Clun House, Surrey Street, Strand, W.C.2.—A card bearing particulars of cables and wires of Swedish manufacture.

**Bankruptcy Proceedings.**—B. G. THOMPKINS, Stanley, Durham, radio engineer.—The receiving order in this matter was made on debtor's own petition. The statement of affairs showed liabilities of £255 against assets of £110. The first meeting of the creditors was held recently at the Official Receiver's office, Newcastle-on-Tyne, when the case being a summary one was left with the Official Receiver as trustee of the estate. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Cooke & Whitfield Wireless, Ltd. | 38 | Newcastle General Supply Co., Ltd. ... ... ... ... | 28 |
| Hicks & Schofield ... ... ... | 32 | | |
| Modern Radio, Ltd. ... ... | 42 | | |

G. R. SPARROW, 11, Cloudesdale Road, Balham, late of Brixton, electrical engineer. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Electrical Accessories ... ... | 66 | Native Lamp Co. ... ... ... | 23 |
| Chapman, Mrs. ... ... ... | 52 | Russell & Amholtz ... ... | 20 |
| Toomer, T. ... ... ... ... | 25 | Holness, J. C. ... ... ... | 105 |

F. F. GREGORY, 2a, Westbourne Road, Luton, Beds., electrical engineer.—The receiving order in this matter was made on April 24th on debtor's own petition. The first meeting of the creditors was held on May 11th at the Official Receiver's office, Northampton. Public examination June 17th, at the Court House, Luton. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Berry's Electric, Ltd. ... ... | 35 | Pope's Electric Lamp Co., Ltd. | 34 |
| Bankers ... ... ... ... | 163 | Sun Electrical Co., Ltd. ... ... | 52 |
| Gregory, H. ... ... ... | 96 | | |

CARR & CHILDE, wireless accessories agents, 38, Park Row, Leeds.—A receiving order was made against this firm in February, 1925, upon the petition of Ashley Wireless Telephone Co., Ltd., creditors for £567, and last week the debtor G. S. Childe applied to Mr. Registrar Warnington at the London Bankruptcy Court for an order of discharge. Mr. Walter Boyle, Senior Official Receiver, reported that the liabilities amounted to £619, and the assets, valued at £51, had realised only 19s. 1d. In 1922 Carr commenced business in Leeds, and in the following year the applicant paid him a premium of £500, and £250 as business capital for a half share in the concern, in which Carr then invested £250 as capital. In November, 1923, requiring more capital, they transferred the business to Carr & Childe, Ltd., for £500 in shares, and £400 in cash, which was paid to the creditors of the firm. The debtors attributed their insolvency to (1) failure to meet overhead expenses; (2) failure by the petitioning creditors to deliver goods in agreed time; and (3) lack of capital. His Honour granted a discharge subject to judgment for £30, to be satisfied by an immediate cash payment.

C. HUBBARD, 13, Magdalen Street, Norwich, electrician and wireless dealer.—The public examination of this debtor was held recently. The statement of affairs showed gross liabilities of £514, of which £206 was expected to rank. Debtor attributed his failure to insufficient capital and delay in the payment of money due to him. His book debts totalled about £300. The examination was closed.

D. E. DAVIES, wireless engineer, Poulton Street, Kirkham.—This debtor, who had a deficiency of £163, appeared at Preston Bankruptcy Court on May 14th, for his public examination. He stated that he commenced in business two years ago with £5, and £45 borrowed from relatives. He had not made any profit from the concern. He attributed his failure to bad trade and illness. The examination was adjourned.

J. A. TREND, electrician, 31, Chapel Street, Luton.—First meeting held May 12th, at the Official Receiver's office, The Parade, Northampton. Trustee, Mr. T. Keens, 11, George Street West, Luton, appointed May 18th. Public examination June 17th, at the Court House, Luton.

A. NORTH & F. NORTH (A. & F. North), wireless and electrical engineers, 38, Bradford Road, and Market Place, Dewsbury. Trustee, Mr. F. Gomersall, 16, Bond Street, Dewsbury, appointed April 22nd.

J. V. WALLIS, wireless goods dealer, 46, King Street, Cambridge, late of 28, Regent Street, Cambridge. Trustee, Mr. J. L. Poland, Official Receiver, 5, Petty Cury, Cambridge, released April 28th.

E. O. HENSTOCK, electrical engineer, 21, Old Road, Brampton, Chesterfield.—First and final dividend of 1s. 10½d. in the £, payable at the Official Receiver's offices, 4, Castle Place, Nottingham.

C. H. PATRICK, electrical contractor, 132, Much Park Street, Coventry.—Receiving order made May 14th, on debtor's own petition. First meeting, May 31st, at the Official Receiver's office, 9-11, High Street, Coventry. Public examination, June 7th, at the County Hall, Coventry.

A. M. WILLMORE, electrical and radio engineer, 45, King Street, Brighton.—First meeting held May 27th, at the Official Receiver's offices, 12a, Marlborough Place, Brighton. Public examination, June 23rd, at the Court House, Brighton.

G. TURNER (Radio Supply Co.), electrician and wireless dealer, 34, Mesnes Street, Wigan.—First meeting, May 28th, at the Official Receiver's offices, 11, Dale Street, Liverpool. Public examination, June 24th, at the Court House, Wigan.

S. PURCELL, electrical contractor, The Arcade, Goole, Yorks.—First and final dividend of 1s. 10½d. in the £, payable at the Official Receiver's office, 21, King Street, Wakefield.

W. H. GREENALL (Hampton Electric Co.), electrician, Newerne Street, Lydney.—First meeting held May 26th, at 34, Market Place, Cardiff. Public examination, June 22nd, at the Town Hall, Newport, Mon.

J. H. PAINTER (Venables & Co.), electrician, 99, The Broadway, Cricklewood, N.W.—Last day for proofs for dividend May 28th. Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

J. N. DAVENPORT (separate estate), (lately carrying on business in co-partnership with L. A. Hackett, as Davenport, Hackett & Co.), electrical engineer and contractor, 36, Spring Gardens, Manchester, late of Albert Mills, Albert Street, Manchester.—Last day for proofs for dividend, May 18th. Trustee, Mr. A. Grierson, 21, Spring Gardens, Manchester.

L. A. HACKETT (separate estate).—Last day for proofs for dividend, May 18th. Trustee, Mr. A. Grierson, 21, Spring Gardens, Manchester. First and final dividend of 20s. in the £, payable June 4th at the Trustee's offices.

J. A. BOSHER, electrical engineer and contractor, 33, High Street, Aberdare.—Last day for proofs for dividend, June 1st. Trustee, Mr. S. E. Clutterbuck, 31, Queen Street, Cardiff.

T. ROBERTS and J. TAYLOR (Roberts & Co.), electrical engineers, late of 61, Old Town Street, Plymouth, and at Fore Street, East Looe.—Last day for proofs for dividend, June 2nd. Trustee, Mr. F. West, 2, Courtenay Street, Plymouth.

M. D. ROSENBLOOM (D. Rose & Co.), electrical engineer, 25, Osborn Street, E.1.—Bankrupt's discharge suspended for three years, until April 30th, 1929.

W. C. RHODES (L. J. Palmer & Co.), electrical engineer and contractor, 141, Newspaper House, Corporation Street, Birmingham.—Discharge granted subject to bankrupt's consenting to judgment being entered against him for £50 (£50 paid in lieu of entering up judgment). Supplemental dividend of 4½d. in the £ payable at the Official Receiver's office, 191, Corporation Street, Birmingham.

T. BARTON, electrical engineer, Electric Works, Ainsworth Street, Blackburn.—Immediate discharge granted.

C. J. NICHOLS (C. J. Nichols & Co.), electrical engineer, 7, Park Street, Bridgend.—Trustee, Mr. C. T. Appleby, 26, Corporation Street, Birmingham, appointed May 14th.

F. V. LAMBERT (Lambert & Curley), electrical contractor, 27, Parrock Street, Gravesend.—Trustee, Mr. W. A. J. Osborne, 119, Finsbury Pavement, E.C., appointed May 17th.

F. H. ARMITAGE, electrical engineer, 9, Occupation Lane, Pudsey.—Last day for proofs for dividend, June 8th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

R. HAWORTH, electrical engineer, 154, Duckworth Street, Darwen, Lancs.—First and final dividend of 8½d. in the £, payable at the Official Receiver's offices, 11, Winckley Square, Preston.

J. HUMPHREYS, plumber and electrical engineer, the Yard, behind the Plough Inn, Oldham, and 22, Buxton Crescent, Rochdale.—First and final dividend of 4½d. in the £, payable at the Official Receiver's office, Byrom Street, Manchester.

**Company Liquidations.**—SCAMMELL & ABBOTT, LTD., Birmingham, electrical and accessories dealers.—A meeting of creditors was held recently, when a statement of affairs was submitted which disclosed liabilities of £1,572, all due to unsecured creditors. The net assets amounted to £276, leaving a deficiency of £1,296. It was reported that Messrs. Scammell and Roberts commenced business in February, 1919, with £200 capital. They were successful at the outset, and in 1922 borrowed £300 for the purpose of extending their business. In April, 1923, the company was formed, and later larger premises were taken. In June, 1925, in consequence of the slump, reduced turnover, &c., the manufacturing side of the business was closed. The wireless trade proved less profitable, and matters went from bad to worse. In March last, Mr. Scammell advanced a sum of £200 to pay the bank, and he was given a debenture for that amount. The liquidator stated that after consulting some of the principal creditors he had disposed of the business, other than the book-debts, for £400. The meeting was adjourned.

GOODCHILD & PARTNERS, LTD., dealers in wireless components, &c., 56-58, Eagle Street, Southampton Row, W.C.—The statutory first meetings of the creditors and shareholders of this company (in compulsory liquidation) were held last week at Carey Street. The winding-up order was made on March 30th upon the petition of a creditor. The Official Receiver reported that the company was incorporated in April, 1919, for the purpose of acquiring a business of engineers' factor which had been conducted by G. W. P. Goodchild, under the style of Geo. W. Goodchild & Partners. In 1920 a subsidiary company was formed for the purpose of selling certain lamps, and in 1924 the activities of this company were directed to the sale of radio valves and components. In February, 1925, the business was transferred to the company, which Goodchild anticipated would transact a large volume of business, but this failed to materialise. In February last a receiver was appointed on behalf of the debenture holder, and the former had since realised nearly all the assets, but he did not expect them to produce enough to cover the amount due Goodchild had attributed the company's failure to its being induced by a "boom" to extend its activities in the provinces, to the flooding of the market with surplus Government stores, to the slump in wireless goods which had set in, and to other causes. The accounts showed total liabilities of £7,159 (unsecured £5,429), and assets valued at £1,729; the latter would be absorbed by the preferential and debenture holders' claims, whilst the account with the contributories disclosed a deficiency estimated at £23,030. In the absence of any resolution the Official Receiver remained in charge of the liquidation.

Kenmac Radio, Ltd., Dalling Road, Hammersmith, radio manufacturers. A meeting of creditors was held on May 20th, at the offices of Messrs. S. E. Denning, 20, Bedford Row, W.C.1, when a statement of affairs was presented which showed total liabilities of £4,348 and total assets of £927, leaving a deficiency of £3,421. The liquidator reported that the company was formed in October, 1924, with a nominal capital of £100, of which only £3 was issued and paid up. The company was formed for the purpose of exploiting a small crystal set in the form of a book. The inventor was Capt. Mackie, and he was a director of the company. In April, 1925, a small factory was taken at Hammersmith. The company had incurred a gross loss of £1,000 and a net loss of £2,200.

Mr. Baker (Wholesale Traders' Association) said that the company was formed with £3 capital, and he considered that instead of Mr. Petrie advancing money from time to time (totalling £3,480) to carry on the business, he should have put up the money in shares. It was decided that Mr. Petrie should offer the creditors 10s. in the £. It was eventually resolved that subject to Mr. Petrie's postponing his claim until the creditors had received 10s. in the £, the voluntary liquidation should be continued, it being agreed that any funds available after Mr. Petrie had also received 10s. in the £ should be distributed *pro rata* amongst the creditors. A committee of inspection was appointed, consisting of Mr. Head, representing the Marconiphone Co.; Mr. E. H. Hawkins, representing creditors; and Mr. Salaman, of the Carrington Manufacturing Co. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Marconiphone Co., Ltd. ... | ... 100 | Denning, S. E., & Co. ... | ... 21 |
| Howard Wall & Co. ... | ... 367 | Chamberlain, E. W. ... | ... 24 |

British Wireless Supply Co. (1924), Ltd.—Meetings of creditors and contributories, June 7th, at the Official Receiver's office, 24, Lower Bond Street, Leeds.

Radio Equipment Co., Ltd.—Liquidator (with a Committee of Inspection), Mr. R. J. Tayler, Coventry House, South Place, Moorgate, E.C., appointed May 1st.

Nelson Electrical Co., Ltd.—A petition for the winding up of this company has been presented to the High Court by E. Durand, trading as C. Melin & Co. and E. Durand & Co., of 7, India Street, Crutched Friars, E.C., and will be heard in London on June 1st.

Burwood (Concessionaires), Ltd.—Particulars of claims to the Liquidator, Mr. G. E. McCanlis, 9-15, Oxford Street, W.1, by June 30th.

Radio Phonopore & Electricals, Ltd.—A petition for the winding up of this company has been to the High Court by Mr. C. W. Slingo, engineer, of 39, Loveday Road, West Ealing, creditor, and will be heard in London on June 1st.

C.A.C. (Radio), Ltd.—A meeting of creditors was called for May 21st at Winchester House, Old Broad Street, E.C. Particulars of claims to the liquidator, Mr. E. W. Sudlow, 358, Cranbrook Road, Ilford, by June 25th.

H. E. Davis, Ltd.—Winding up order made by the High Court on May 11th.

Reflex Radio Co., Ltd.—Winding up order made by the High Court on May 11th.

British Wireless Supply Co., Ltd.—Winding up order made by the County Court of Yorkshire held at Leeds on May 4th.

**Dissolutions of Partnership.**—Electrical Services, electrical engineers, Sudbury, Suffolk.—Mr. P. J. Gates and Mr. S. Downs have dissolved partnership.

Electrical Installation Co., electrical engineers, 25, St. Mary's Row, Moseley, Birmingham.—Mr. E. Cooper and Mr. T. Yarnit have dissolved partnership.

**Private Arrangements.**—J. L. Smith and H. G. Smith, trading as J. L. Smith & Co., electrical and radio engineers and contractors, 45, Queen's Road, Peckham, S.E.15.—A meeting of creditors was held on May 13th, at the offices of Messrs. Harper Stringer & Co., Queen Street, E.C., when a statement of affairs was presented, which disclosed liabilities of £431, and a surplus of £30. Mr. Stringer reported that Mr. J. L. Smith had been in business for a number of years and he was joined by Mr. H. G. Smith, who was no relation, in 1924, and he introduced about £300 capital. The present position was attributed to declining business. No offer was made, and the creditors decided that the debtors should execute a deed of assignment in favour of Mr. Stringer as trustee, with a view to the sale of the business as a going concern. It was the trustee's opinion that the creditors would receive 20s. in the £. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Kye, Ltd. ... ... ... | ... 33 | Hammond & Smaldon ... | ... 23 |
| White, B. E. ... ... | ... 46 | Robinson, A. S., & Co. ... | ... 21 |

C.A.C. Radio, Ltd., 10, Rangoon Street, Crutched Friars, E.C.3, and at Bournemouth and Leeds.—At a recent meeting of creditors Mr. E. W. Ludlow read a scheme prepared by the committee of inspection. Mr. H. Burford Judge intimated that it was not acceptable to the cash creditors unless the bank was accorded a certain amount of preference. The creditors present unanimously refused to accept the scheme with this reservation. Mr. G. Powell Stevens (British Industrial Exhibitions, Ltd.) proposed, and Mr. Roberts (Messrs. Thomas March, Ltd.), seconded, a proposal that in the event of the company's passing into voluntary liquidation the trade creditors should recommend that their nominee, Mr. E. W. Ludlow, be appointed liquidator.

D. H. Robertson, trading as Electrical Agencies, 1, Chapel Hill, Clevedon, electrical contractor.—A meeting of creditors was held recently, at the offices of Messrs. E. T. Collins and Son, Bristol, when a statement of affairs was presented which showed liabilities of £274. The net assets were estimated at £126, leaving a deficiency of £148. The debtor commenced trading, without capital, in January, 1923. He was later joined by a partner, who brought in £50, but the partnership was dissolved in three months, the debtor repaying the £50. The present position was attributed to lack of capital and loss on trading. There was no offer of a composition, and it was decided to confirm the deed of assignment which had already been executed to Mr. Arthur Collins to protect the estate. A committee was also nominated, consisting of the representatives of the Sloan Electrical Co., Ltd., the General Electric Co., Ltd., and J. H. Lewarn & Son.

The principal creditors are:—

| | £ | | £ |
|---|---|---|---|
| Baxter, T. ... ... ... ... | 30 | Sloan Electrical Co., Ltd. ... | 50 |

**Illumination Design Course for Contractors and Wholesalers.**—Another of the excellent illumination design courses arranged by the E.L.M.A. Lighting Service Bureau is to be held at the Bureau in Savoy Street, W.C.2. This time it is for electrical contractors and wholesalers, who will assemble on Monday, May 31st, for a four-days' course, comprising morning and afternoon sittings from day to day until Thursday afternoon, June 3rd. The subjects of the lectures and demonstrations will be:—The Magnitude of the Lighting Business; Lighting Fundamentals and Principles of Distribution; a Practical Lighting Demonstration; Economics of Light Production; Simplified Methods of Designing Illumination Schemes; Light and Industry; Planning a Factory Lighting Scheme; Electric Lamp Manufacture; Contracts and Sales Rules for E.L.M.A. Lamps; the Possibilities of Colour Lighting; Solving Special Lighting Problems; Standardisation of Lamps and Lighting Equipment; the Lighting of Offices; Floodlighting and its Possibilities; Analysing the Lighting Market; the Lighting of the Home; Display Window Lighting; Efficient Lighting for Shops and Stores; Advertising Lamps and Light; Electrical Advertising; and Selling Better Lighting. The proceedings will close with an informal dinner at Carr's Restaurant, Strand, at 6.30 p.m., on Thursday, June 3rd. There will be accommodation for 80 visitors at the Bureau, and we are confident, taking into account the justifiable popularity of these courses, and the excellence of the arrangements made by the E.L.M.A. staff for the convenience and accommodation of those attending them, that this number will be reached. It is therefore important that applications should be lodged at once.

**Safety Lamps in Mines.**—The Secretary for Mines has made an Order, under Section 33 of the Coal Mines Act, 1911, approving for use in all mines to which the Act applies, subject to the conditions specified in the schedule to the order, the following types of electric safety lamps:—

Pearson "Ni + Fe" (square).
Pearson "Ni + Fe" (5-volt).
Edison Cap.
Patterson Cap Type J1 and K1.
Wolf Cap.
Worsnop's "Maxilux."
Pearson "Ni + Fe" Officials' Pocket.

**For Sale.**—Messrs. Veryard & Yates will sell by auction at an early date, at the Y.M.C.A. Huts, Waterloo Road, S.E., large quantities of wireless, electrical and general stores, &c. Mr. E. Fryett will sell by auction on June 3rd, at the London Trade Sale Rooms, 78 and 81, Fetter Lane, a quantity of telephone wire and cable. The Manchester Electricity Committee has for disposal 36 field rheostats, 220 and 520 V. (See our advertisement pages to-day.)

**German Enterprise in Turkey.**—According to a German correspondent at Constantinople, the establishment of small central stations in Turkey is making progress as a result of the activity of the German firms of Siemens, the A.E.G., and Bergmann. Quite recently the Turkish Electrical and Radio Co. has been formed with the participation of the firm of Siemens, and a prominent share in it has been taken by the Isch Bankassi (Bank of Commerce), which is directly supported by the Government. The foundation stone of the new works to be erected by the company was recently laid at Eski-Shekhir, which is an important railway base, where the central repair shops are situated. In the first place, the new works is intended to produce electrical apparatus and accessories so as to be able to emancipate the country from dependence upon others for these requirements.

**Electricity and Gas at Leeds.**—The Corporation Electricity Committee proposes to erect an all-electric bungalow, for demonstration purposes, on a vacant site at the junction of Calverley Street and Portland Crescent; and the Gas Department is to erect on the same site an all-gas bungalow, also for public demonstration purposes.

**Standard Accumulator Components.**—In connection with its provisional standards for battery crates, moulded accumulator containers, terminal posts and cable connectors, the Standards Department of the Society of Motor Manufacturers and Traders has issued a list of nineteen firms which are manufacturing and supplying battery components in accordance with the standards.

**Lead.**—Reporting on May 22nd, Messrs. James Forster and Co. stated that the position had undergone little change since their last report, the interference with consumption in this country by the strike being offset by a better demand from the Continent. "Supplies are as plentiful as ever and now that consumption is being held up by a threatened shortage of fuel, the position is not likely to get any better, but rather the reverse. The market, on the other hand, contrary to general expectation, has quite a firm undertone which can only be ascribed to sentimental reasons as a result of the settlement of the general strike. With a return to normal conditions the position of lead would seem to be quite sound and there would be no reason to anticipate prices going much lower."

**Our Foreign Trade.**—The following were the values of imports and exports of electrical goods and machinery during April, 1926:—

| | April, 1926. | Inc. or dec. | 4 months, 1926. |
|---|---|---|---|
| *Imports*— | £ | £ | £ |
| Electrical goods and apparatus | 289,606 | −66,251 | −283,575 |
| Machinery ... ... ... | 1,250,729 | +227,451 | +479,134 |
| (Electrical machinery) ... | 111,404 | +13,306 | +2,922 |
| *Exports*— | | ... | |
| Electrical goods and apparatus | 786,252 | −315,568 | −477,098 |
| Machinery ... ... ... | 3,594,732 | −241,542 | −331,042 |
| (Electrical machinery) ... | 412,862 | −90,799 | −82,477 |
| *Re-exports*— | | | |
| Electrical goods and apparatus | 17,144 | −5,646 | −21,781 |
| Machinery ... ... ... | 121,389 | +1,076 | +1,825 |
| (Electrical machinery) ... | 7,960 | +2,541 | +9,571 |

**Russian Electrical Progress.**—A report presented to the Presidium of the Supreme Economic Council says that none of the existing regional electric power stations worked by steam is large enough to meet the demands for power, although the capacity of the stations for the general supply of power is twice as large as in 1917. Out of seven power stations built according to the programme of the State Commission for the electrification of Russia, five stations with a power at the beginning of the year 1925-26 of 90,000 kW, have been extended during this year to produce nearly three times as much (266,000 kW) and further extensions are already planned. The Shterovski station will begin to work in the autumn, and its capacity is to be more than doubled during the next few years. As soon as the Volkhov station is finished in the autumn the question will arise of installing another hydro-electric station for the Leningrad district. This shows that in the great industrial centres the growth of the demand for electrical power considerably exceeds the pace of electrical construction. Altogether in 1925-26 nine stations will begin production with a capacity of 183,500 kW, and eleven stations are to be equipped to produce 271,000 kW, out of which four, with a capacity of 90,000 kW, are new stations. The Supreme Economic Council has requested the Glavelektro to prepare a report on the plans for the development during the next five years of the electrification of the country.—*Reuter's Trade Service* (Moscow).

**Rewards for Strike Service.**—The Westminster Electric Supply Corporation, Ltd., has given gratuities to members of its power station staff who remained at duty during the strike.

**The Wireless Retailers' Association.**—The annual general meeting of the Wireless Retailers' Association of Great Britain, at which the president, Sir Charles Bright, was present, was held on April 28th. The chairman of the Executive Council, Mr. F. S. Horsey, in the course of an address, said that progress had continued, and the position of the Association had been improved and strengthened in every way. The trade discounts allowed by manufacturers generally had greatly improved during the last two years, and they were now substantially adequate in most cases. The efforts of the Association had contributed materially to that result. In an endeavour to raise the status of dealers, it was decided some eighteen months ago to issue a certificate to members. One of the objects was that it should be a guarantee to the public of reliability and efficiency. The conditions enforced were solely in the interests of members themselves, and were based on those existing in the best organisations. A handbook had been issued containing particulars of the aims, objects and activities of the Association, to retailers generally. Mr. Horsey referred to the formation of the Society of Radio Manufacturers, which had realised the need for dealing adequately with retailers in the matter of discounts, and considered that each section of the industry must have its own representative association. In conclusion, Mr. Horsey said that there were strong indications that under the new order of things which was developing, manufacturers and retailers as independent bodies would co-operate for the common good. By that means the trade might be made an honoured and a lucrative one.

**Copper, Lead and Rubber Prices.**—Messrs. F. Smith and Co. report May 25th:—Copper (electrolytic) bars, £64 15s., 5s. decrease; do. do. sheets, no change; do. do. wire rods, £74 15s., 5s. decrease; do., do. h.c. wire, 9¾d., ¼d. decrease.

Messrs. James & Shakespeare report May 25th:—Copper bars (best selected), sheet and rod, no change; English pig lead, £30, 5s. decrease.

Messrs. Edward Till & Co. report May 25th:—India-rubber, Para, fine, 1s. 8¾d., 1¼d. decrease.

**Book Notice.**—"The Annual Report and Accounts of the Electrical Trades Benevolent Institution for 1925." London: The Offices of the Institution, 98, Grosvenor Road, S.W.1.

# Lighting and Power Notes.

**Argentina.**—ELECTRICAL DEVELOPMENT.—In its report for 1925, the Cia. Italo-Argentina de Electricidad states that during the current year two 25,000/30,000-kVA turbo-generators are to be installed and put into commission, increasing the capacity of its Pedro Mendoza power station to 100,000 kVA. Additional converting plant is to be installed at various sub-stations, which will raise the total capacity of these stations to 38,300 kW.

The report of the Compania Hispano Americana de Electricidad (Chade) shows that during the past twelve months the number of consumers advanced by 21,692 to a total of 206,320, representing a load of 574,449 kW. The output of the various power stations of the company totalled 496,698,392 kWh in 1925, an increase of 10.77 per cent. as compared with 1924. Work is well in hand on the extensions at the principal power station, where the fourth and fifth 25,000-kW steam turbo-generators are in course of erection. The sixth and seventh sets of similar capacity are about to be shipped from Europe and are expected to be ready for operation by the next Argentine winter. Twelve new boilers have lately been put in service and twelve more have been ordered. The company has commenced the construction of a new power station, the ultimate capacity of which will be 600,000 kW. Two 52,500-kW turbo-alternators have been ordered for this station as well as eight boilers to be adapted for pulverised fuel firing. The total length of the company's distributing mains now amounts to 4,354 miles.

**Ashford (Kent).**—ELECTRICITY AGREEMENT.—The Urban District Council has adopted an agreement for a supply of electricity to the premises of the Southern Railway Co.

**Beckenham.**—MAINS EXTENSIONS.—The Electricity Committee is to extend its mains to housing estates at a cost of £3,500.

LOAN SANCTIONED.—The Urban District Council has received sanction to the borrowing of £26,000 for h.p. feeder mains.

**Birkenhead.**—ELECTRICITY SUPPLY TO WIRRAL.—The Finance Committee of the Corporation has under consideration a recommendation of the Electricity Committee to give a supply of electricity to the Wirral Rural District Council on terms similar to those made in the out-townships of the Corporation's present area of supply. A special meeting of the Town Council may be called to consider the matter.

LOANS.—The Electricity Committee is applying for sanction to loans of £30,500 for mains and £10,500 for h.p. feeders. Sanction has been received to a loan of £5,500 for transformers and switchgear.

**Budleigh Salterton.**—STREET LIGHTING.—The Urban District Council has decided to invite tenders for lighting the town from the local gas and electricity companies.

**Calne.**—INAUGURATION OF SUPPLY.—An electricity supply for the town was formally inaugurated on April 23rd. Electricity is obtained at 220 V d.c. from Messrs. C. & T. Harris (Calne), Ltd., and supplied to consumers at 10d. per kWh for lighting and 6d. per kWh for power.

**Clayton.**—INQUIRY POSTPONED.—The Electricity Commissioners recently informed the parties concerned that the inquiry fixed for May 19th in Bradford to hear applications from Clayton, Bradford, and the Electrical Distribution of Yorkshire, Ltd., for an Order to distribute electricity in Clayton was postponed. This has been necessitated by the dislocation of the Commissioners' arrangements consequent on the general strike.

**Continental.**—ITALY.—Work is shortly to be commenced by the Società Edison, of Milan, on the establishment of a steam-operated power station at the port of Genoa. The plant will have a capacity of 100,000 kW and will be provided with boilers adapted to use pulverised coal as fuel.

LUXEMBURG.—The A.E.G., of Berlin, in conjunction with the Rhenish-Westphalian Electricity Supply Co., has drawn up a scheme to provide the Grand Duchy of Luxemburg with a greatly increased electricity supply by utilising, by means of two dams, the water power of the River Our, which forms the frontier between the Grand Duchy and Germany. It is proposed to form two large lakes, one of which would have a capacity of 176,076 million gallons, and the other a capacity of approximately 1,100 million gallons. It is estimated that the scheme would cost about five millions sterling.

SWITZERLAND.—According to a report lately issued by the Swiss Water Economy Department, the total available water power of the country is equal to 4 million h.p. for an average of 15 hours per day. Of this only one million h.p. is so far being utilised. At the beginning of the present year work was in hand on the establishment of several new hydro-electric stations, among them being the Ober-Ems, with a capacity of 11,000 h.p., the Vernayaz (108,000 h.p.), the Handeck—the first of three on the Upper Hasli—(100,000 h.p.), and the third extension of the station on the Lungern Lake which will increase its capacity from 20,000 to 22,000 h.p.

**Croydon.**—LOAN.—The Electricity Committee has recommended that sanction be obtained to the borrowing of £60,000 for mains extensions.

DOMESTIC APPARATUS.—The Committee is voting £5,000 for the purchase of domestic apparatus to be let out on hire. The total expenditure for this purpose amounts to £15,312.

**Eastry.**—ELECTRICITY SUPPLY.—Messrs. Pearson & Dorman Long, Ltd., have informed the Rural District Council that they are arranging for the laying of an underground cable along the

Nonington Woollage Roads, and the cable will be sufficient to allow for public lighting in addition to supplying electricity for houses.

**Epsom.**—NEW PLANT.—The Urban District Council has received formal consent to the installation of two Diesel engines, together with the necessary auxiliary plant. The electrical engineer has submitted a revised estimate for the erection of the new plant in an extension of the existing engine room at an estimated cost of £14,500.

**Hazel Grove and Bramhall.**—LOANS.—The Urban District Council has applied for sanction to loans of £2,200 for mains and services for Woodford, and for £1,500 for the general purposes of the undertaking.

**India.**—MADRAS HYDRO-ELECTRIC PROJECT.—The Governor of Madras recently laid the foundation of the important Pykara-Moyar hydro-electric project which is to utilise a fall of 3,088 ft. where the River Pykara descends from the Nilgiri plateau into the plain near the Mysore border, 14 miles from Ootacamund. The proposed dam, 164 ft. high, will impound 3,826 million cubic feet, with a water-spread of 2¼ square miles. Owing to the absence of a suitable saddle for the discharge of surplus water, the dam will be of the pierced type, discharging surplus as well as the normal discharge for the development of power through sluices in the body of the dam. The supply required for the generation of power will be picked up from the river by a low masonry weir, three miles below the dam, and conveyed through a head sluice and a flume channel 5,220 ft. long to the forebay, which will be formed by closing the ends of a natural depression by two earthen bunds. The surplus flood discharge of the river will pass over the falls as at present. The main transmission line will be carried up the hill and *via* Ootacamund, Wellington, and the valley down which the road and railway to Mettupalayam pass, to Mettupalayam, whence one main transmission line will proceed to Madras and another to Dindigul. The scheme will supply power in bulk to the Municipalities of Ootacamund and Coonoor, the Wellington Cantonment, the Cordite Factory at Aruvankadu, Coimbatore, Madras, Trichinopoly, Dindigul and Madura, and to the South Indian Railway for electrification between Madras and Villupuram and between Trichinopoly and Madras. This route is flat and easy throughout, and the distance from the power station to Madras is 296 miles.

MOYAR SCHEME.—The subsidiary scheme, known as the Moyar project, which will feed additional power into the Pykara mains, is designed to utilise a second time the water which passes through the turbines at the Pykara power house. This water will be conveyed by a channel 6,800 ft. long to the Avaraihalla river, picked up again nearly five miles lower down and passed through a small forebay and valve tower down a second pressure pipe 2,000 ft. long to a power house on the banks of the Moyar River, with a fall of 1,050 ft. The turbines at this station will develop an additional 18,000 b.h.p. and the generators will deliver an additional 34.6 million kilowatt-hours. Thus the whole scheme will provide 66,480 e.h.p. at full load and about 150 million kWh per annum. The power from the Moyar station will be transmitted 8¼ miles to the Pykara power station, where it will be fed direct into the Pykara main transmission line at 132,000 volts. This supplementary scheme will utilise the same storage works and transmission line as the Pykara power station. The Moyar scheme alone is estimated to cost only Rs.16,45,000, but the total cost of the combined Pykara-Moyar schemes, including indirect charges, is estimated at Rs.2,73,60,000. The complete scheme has not yet been formally sanctioned by the Government or the Secretary of State for India, but it is hoped that sanction will not be long delayed.

**Irish Free State.**—BLACKROCK (DUBLIN).—At a recent meeting of the Urban District Council the report of the Electric Light Committee was adopted, granting a lease of 42 years to the Kingstown Urban District Council for the supply of electricity for lighting, provided that at least 50 per cent. of the labour required for the maintenance of the supply be drawn from Blackrock.

**Maidenhead.**—OBJECTION TO SCHEME.—The Rural District Council has decided to raise an objection to the application of the Cookham and District Electricity Corporation to erect overhead lines in the Cookham Dean district.

**Northern Ireland.**—LURGAN.—The Ministry of Finance of Northern Ireland has sanctioned a loan of £11,305 applied for by the Urban District Council for the purpose of carrying out an electricity scheme for the town. It is reported that the scheme will be in operation by next October.

LISBURN (CO. ANTRIM).—The Urban District Council has decided to ask a Special Committee to report on a proposal to purchase electricity in bulk from the Belfast Corporation and distribute it by overhead and underground cables.

**Poulton-le-Fylde.**—ELECTRICITY SUPPLY.—The Urban District Council has consented to an application by Blackpool Corporation for authority to supply electricity in its area.

**Price Reductions.** — Reductions in the charges for electricity have been made or recommended in the following districts:—

BARNSLEY.—Residential two-rate tariff "unit" charge from 1d. to ¾d.; weekly charge in the Council houses from 1s. per week to 9d. per week, and electricity consumed from 1d. to ¾d. per kWh.

SLAITHWAITE.—Lighting, flat rate: From 7d. to 6d. per kWh. Domestic rate for private houses, 15s. per room per annum, plus 1d. per kWh instead of 2d.

DONCASTER.—General lighting, from 5½d. to 4½d. per kWh during the summer quarters, but to remain at 5½d. in the winter quarters, with a rebate of 1d. per kWh for the equivalent number of kWh used during the two summer quarters. Signs and shop-window displays: From 2½d. to 2d. per kWh. Prepayment meters: From 6½d. to 5½d. per kWh. Domestic supplies: The fixed charge of 15 per cent. on the net rateable value of the premises, plus ¾d. per kWh in the summer quarters, and 1d. per kWh in the winter quarters, reduced to 12½ per cent. on the net rateable value, with a minimum annual payment of £1 15s., plus the existing charges for electricity used.

**Special Orders.**—The Electricity Commissioners have submitted to the Minister of Transport for confirmation the following Special Orders made by them:—The Urban District Council of Llantarnam for the supply of electricity in the district; the Derbyshire and Nottinghamshire Electric Power Co., for the supply of electricity in part of the rural district of Shardlow; the Bingley Urban District Council to supply in part of the township of East and West Morton.

The Scarborough Corporation has applied for a Special Order authorising it to supply electricity in the borough and rural district of Scarborough and in the urban districts of Scalby and Filey.

**Sunderland.**—ELECTRICITY SUPPLY.—The Sunderland Corporation has agreed to supply electricity through pre-payment meters in certain instances to houses of three to six rooms, at a charge of 6d. per kWh, being 3½d. per kWh for electricity and 2½d. per kWh for the hire and maintenance of the installation. A 325-kVA static transformer with switchgear is to be installed at the Whickham Street sub-station, at an estimated cost of £753.

**Swansea.**—ELECTRICITY IN BULK.—The Electricity Committee has decided to provide a bulk supply of electricity to the Cwyllynfell and New Brock collieries, Amman Valley, at a cost of £16,000.

MAINS EXTENSIONS.—The Committee is to carry out mains extensions at a cost of £2,000.

**Syria.**—ELECTRICAL DEVELOPMENT.—A message from Beyrouth states that in accordance with a decree of the Governor of Great Lebanon, the Société des Forces de la Khadiehach has begun the construction of a hydro-electric power station which will have an initial capacity of 1,500 h.p., and which can be brought up to 3,000 h.p. by using another waterfall. The new station is to supply electricity to Tripoli, Charre, Masroum and Edho. The company intends shortly to erect a similar station for the town of Zahle.—*Reuter's Trade Service* (Paris).

**Torquay.**—ELECTRICITY IN BULK.—The electrical engineer has furnished a special report to the Town Council with regard to the proposal to provide a bulk supply of electricity to the Brixham Gas & Electricity Co., including the charges at which the supply could be given for distribution in Brixham and Churston Ferrers. The report has been submitted to the company for consideration.

**United States.**—ST. LAWRENCE DEVELOPMENT.—The New York correspondent of *The Times* reports that the New York State Power Commission is expected shortly to grant licences for a huge project for the development of the water power of the St. Lawrence to the Frontier Corporation, owned by the America Aluminium Company, Dupont De Nemours and Co., and the General Electric Company. The Frontier Corporation has proposed that the development should be undertaken by the United States alone or jointly with the Ontario Government. The Commission is understood to be in favour of the former plan which comprises two schemes, the first at Cat Island, where Lake Ontario enters the St. Lawrence, and the second at the foot of the big Saulte Rapids.

**Weymouth.**—NEW PLANT.—The Electricity Committee has received consent to the extension of the generating station by the installation of one 1,500-kW, 3-phase, 50-cycle turbo-alternator, two 20,000-lb. boilers and auxiliary plant.

LOAN.—The Committee has recommended that application be made for sanction to a loan of £3,000 for the purchase of electric cookers.

**Workington.**—EXTENSION OF SUPPLY.—The Town Council has offered a supply of electricity to the Seaton district at 7d. per kWh for private lighting, 3d. per kWh for power, and for public lighting at £4 per lamp per annum. As an alternative the Council offers a bulk supply at the borough boundary at a charge of 2d. per kWh with a minimum of 20,000 kWh per annum.

## Tramway and Railway Notes.

**Japan.**—ELECTRIC RAILWAYS.—An electric railway company is in course of formation with a capital of 5,000,000 yen. The company will be named the Fuji-sanroku Denki Tetsudo K.K., its object being to construct an electric railway to a national park to be laid out at the foot of Mount Fuji. The company will be granted 7 per cent. subsidiary interest by the Government under the Local Railway Subsidy Law.

The directors of the Tobu Railway Co. have recently decided to increase the capital of the company from 24,500,000 yen to 50,000,000 yen, in order to finance the extension and electrification of its lines.

(*Continued on page 799*)

# Hydroelectric Power on the Lower Isère.

## The First Transmission in France at 120,000 Volts.

By T. RICH.

IN the South-East of France near the headwaters of the Loire lies the industrial district of St. Etienne; although comparatively close to the Rhone Valley it is separated therefrom by a rugged ridge of hills. This district is not well known to English people as, in a way, it lies off the beaten track; but, owing to a large extent to the existence of collieries, it has been for a number of years an important centre of industry, especially for the manufacture of arms, cycles, tools, and special kinds of steel. The war, with the temporary destruction of the northern industrial area and the danger to Paris industries through bombing, led to a great development of manufacture in the south, and this has created a demand for power from various quarters, especially in this district.

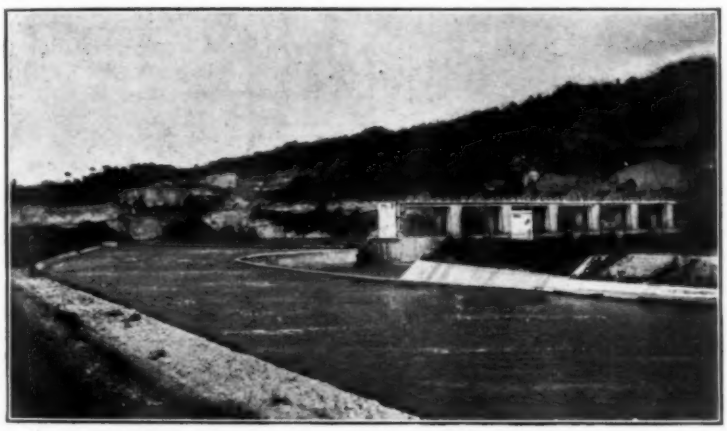
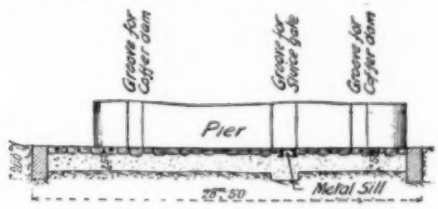


Fig. 1.—The Barrage on the Lower Isere.

The watershed of the Isère has been for the last forty years perhaps the most important centre of French water-power development; until recently practically all the power has been developed in the district, which stretches from the Alpine region, bordering on the Italian Frontier, to the watersheds of the tributaries the Drac and the Romanche, whose waters flow into the Isère near Grenoble, which town lies at an altitude of 700 ft.

The development of the water power and navigation of the lower section of the Rhone Valley has been studied for some time; of the former, the power station at Beaumont-Monteux, on the Lower Isère, 4½ miles from its junction with the Rhone, near Valence, is a good beginning; and of the latter the canal tunnel into Marseilles Harbour, which is over 70 ft. wide, to take 1,400-ton barges into a lagoon connected by canal with the Rhone, is an important step, besides being a very fine bit of engineering work.

The problem of the utilisation of a rapidly-running river, liable to very heavy floods after the melting of the upland snow and to a comparatively small flow of water at some seasons of the year, is not so easy as it looks. The site of the Lower Isère power station was chosen where good deep-river banks were available, so that the backing up of the water to the extent of 4.6 miles, due to the erection of a barrage across the main stream, would not give rise to the flooding of valuable lands. In view of the extraordinary floods to which this snow-fed river is subjected, instead of placing the power house on the barrage itself, as is often done, it is placed at the end of an artificial cut formed into a by-pass. The main river is closed at times of low water by means of adjustable sluices, which in time of flood can let pass along the main stream all the water not required for the purposes of power generation.



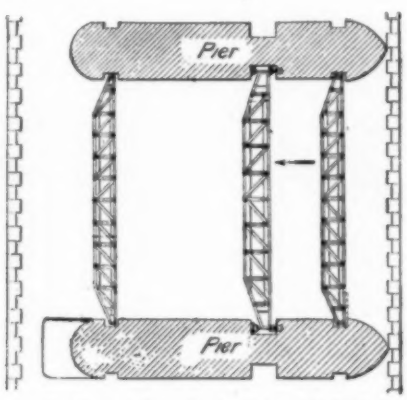




Fig. 2.—One Pass of Dam, showing Gate and Coffer-dams

A barrage, fig. 1, 440 ft. long, is placed across the river; it has six openings, each 17.5 metres (57.4 ft.) wide, arranged to hold up 10 metres (33 ft.) of water.

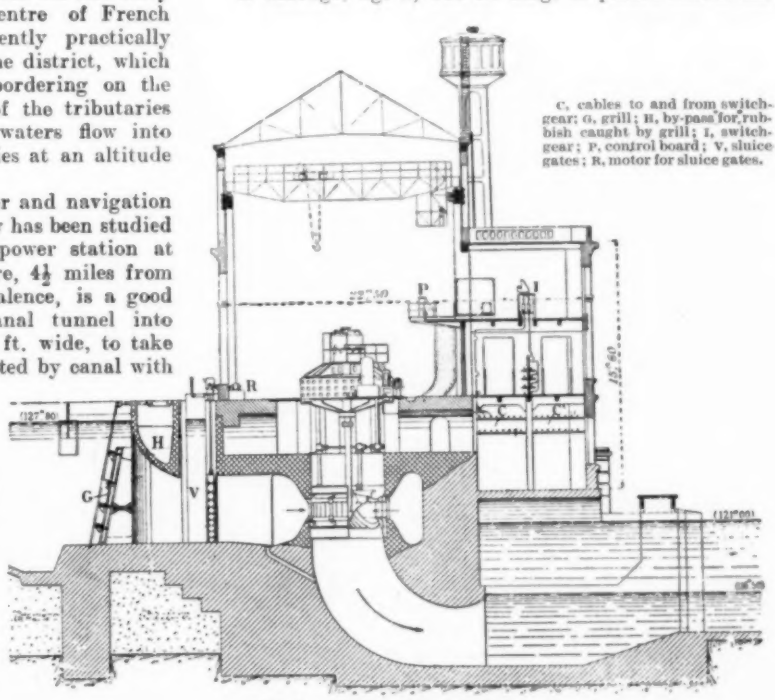

C, cables to and from switch-gear; G, grill; H, by-pass for rubbish caught by grill; I, switch-gear; P, control board; V, sluice gates; R, motor for sluice gates.
P
R
H
G
V

Fig. 3.—Section of Power Station.

The low-water flow is 90 cubic metres (117.7 cu. yd.) per second. At flood time in spring the flow reaches 1,500 cu. metres per sec. By lowering the water level to the extent of one metre a peak load covered by 11,000 kWh can be dealt with.

The foundations of the piers of the barrage are built

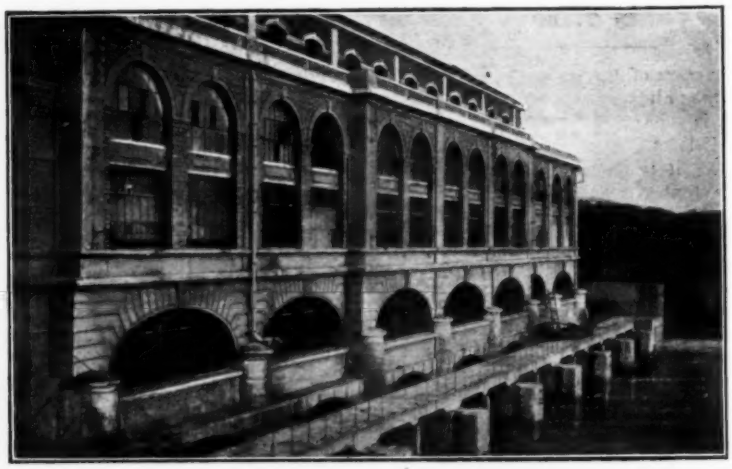


Fig. 4.—Downstream Side of Power House.

on a raft made with "ciment fondu" armoured with rails covered with a stone pitching. The piers are 23 metres long and 4.2 m. thick; they are joined by three armoured-concrete ties, which form passage ways. The walls of the piers were built up of pre-cast concrete blocks made with a rich mixture, .50 × .28 × .22 metres, as headers and stretchers, filled in with ordinary concrete, and grouted afterwards under pressure to secure a perfect union: this method of procedure allowed the work to take place with great rapidity during the time when the river conditions were favourable.

The sluice gates, fig 2, are of the "Storey" type; their total height is 10 metres and width 18.77 m. overall; at the top of each sluice a section 1 metre deep is arranged on a pivot so that a certain quantity of water can be allowed to flow over the top. The sluice rests on a cast-iron sill embedded in the concrete; the gates are not balanced, and they are lifted by means of chains and winches operated by motor-driven shafts. They are fitted with emergency hand drive. The motor of each sluice is of the 3-phase type, 38 h.p., 570 revs., 220 volts; it is arranged with an automatic brake, and an automatic cut-off which cuts out when the gate reaches the top of the travel; the controller is of the tramway type. The movable flap at the top of each sluice gate is operated by means of wire ropes and drums through a horizontal shaft with reducing gear connected to a 5.5-h.p. motor, 930 revs., 220 V. Each sluice gate weighs about 150 tons; it can be raised at the rate of about 8 in. a minute. Each pier of the barrage is arranged with extra grooves on the upstream and downstream sides; in case of repair being necessary, temporary coffer dams made of steel plate reinforced by lattice work, divided up for convenience into horizontal sections, are placed in these grooves, six on the upstream side and two on the downstream. They are put in place by means of dismountable lifting gear placed on the piers. To resist the extra turning moment which exists when these coffer dams are in use, the piers are reinforced by H iron embedded vertically in the concrete. For the building of the barrage a cableway was used, of 190 metres span, with a 3-ton lift.

The inlet to the head canal is joined to the barrage pier on the right bank of the river; it is protected by a grid 145 metres long (158.5 yd.), which is made of flat bars 60 mm. × 8 mm. (2.3 × .3 in.), inclined at an angle of 1 in 5, and leaving spaces of $2\frac{3}{4}$ in. It is supported by an armoured-concrete bridge. The upper end of the grid is connected to the wall of the inlet canal by means of a lifting grid, which allows rafts to pass along the canal, and eventually barges. In accordance with the concession for the hydraulic development, when a chain of power houses has been placed up the River Isère in accordance with the programme of development, means have to be provided for navigation; space therefore has been left alongside the power house which will allow of the construction of a lock 12 metres wide and 46 metres long.

The inlet canal is 1,600 metres (practically a mile) long; its walls and bottom are of concrete, 30 cm. (11.8 in.) thick where made of cement concrete, and 50 cm. (19.7 in.) where lime concrete is used; expansion joints made with bitumen sheeting are placed every 7 metres. The walls are sloped 1 in 1, the rendering at the normal water line being strengthened by armouring.

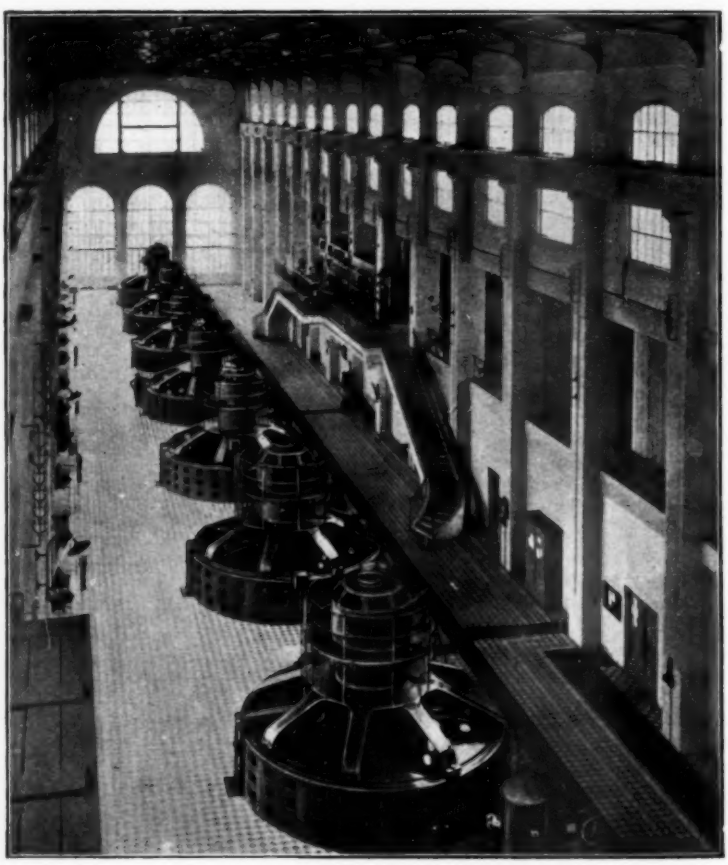


Fig. 5.—Interior of Power House.

The canal is 41.2 metres (135 ft.) wide and 4.6 metres (15 ft.) deep; the cross sectional area is 168.36 sq. metres, and the slope is 1 in 6,400, giving, according to the Bazin formula, a mean speed of 1.95 metres per second.

At the power station a grid is provided 73.5 metres wide, made up of bars 80 mm. × 10 mm. (3.15 × .39 in.) placed 2.75 in. apart; it rests against an armoured concrete trough, into which floating objects can be raked.

**The Power Station.**

The station is founded on a bed of compact clay, so that, although the foundations were sunk to 8 metres (26.2 ft.) below the mean level of the River Isère, it was not necessary to use compressed air. Fig. 3 shows a section, fig. 4 the downstream side of the building, and fig. 5 the interior of the station.

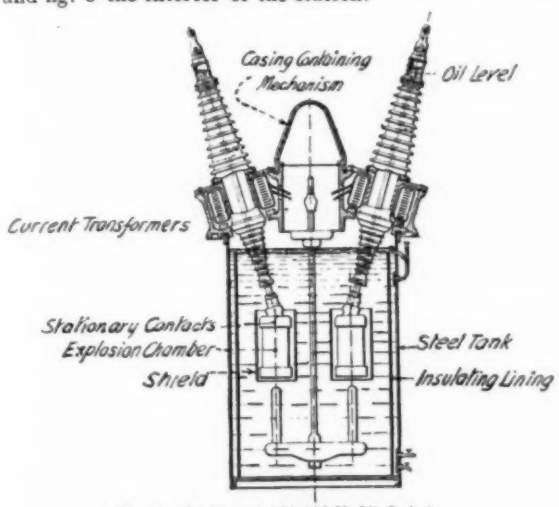



Fig. 6.—Section of 120,000-V Oil Switch.

There are seven turbine sets, of the vertical type, running at 107 revs. per minute, placed 10.5 m. (34.4 ft.) apart. The turbine house is 106 metres long and 15 metres wide; it is spanned by a 45-ton travelling crane. The turbine inlets are made of armoured concrete and they can be closed individually by steel sluices, which can be operated by hand or by electric motor; operation is facilitated by means of a by-pass valve by which the inlet chamber can be filled and equilibrium established. The draught tube is also formed in concrete. The outlet of each turbine is arranged in cells, which can be closed for examination by means of temporary coffer dams.

The turbines are of the Francis type, made by the firm of Neyret-Beylier and Piccard-Pictet, of Grenoble; they have an output capacity of 5,600 h.p. each, under a net head of 10.2 m. (33.45 ft.) and 6,400 h.p. with 11.3 metres (37.05 ft.) net head.

The turbine wheel is 4 metres in diameter, weighing 12 tons; it will pass 50 cubic metres of water a second. The wheel is bolted to a vertical shaft 400 mm. (15.75 in.) in diameter; the turbine shaft is supported by a water-cooled thrust bearing, which has to take the combined weight of the turbine wheel and alternator and the effect of the water flow, a total of 150 tons. Fig. 8 shows a wheel of cast iron made in one piece.

The turbine makers after considerable experiment developed and patented a thrust bearing to suit such conditions. A bell-shaped casting is fixed on the upper end of the shaft, the rubbing surface being a flat disk fastened to the casting by screw bolts. This disk revolves in an oil bath on a series of shoes separated by oil spaces, the shoes in turn being supported on a ring casting with a special seat. The revolving disk, when passing across the gaps between the shoes, draws the oil after it, and forms a film between the surfaces, and therefore without any oil pumping or pressure the bearing is kept cool and lubricated. A coil of copper pipes for circulating water is placed in the oil bath; from the point of view of bearing heating in the ordinary way, the use of this cooling coil has not been found necessary but it has been put in as a safeguard in view of the high temperature which sometimes occurs in the power station itself, due to atmospheric conditions. The turbine guide vanes are actuated by a governor and servo-motor, which can be controlled from the switchboard.

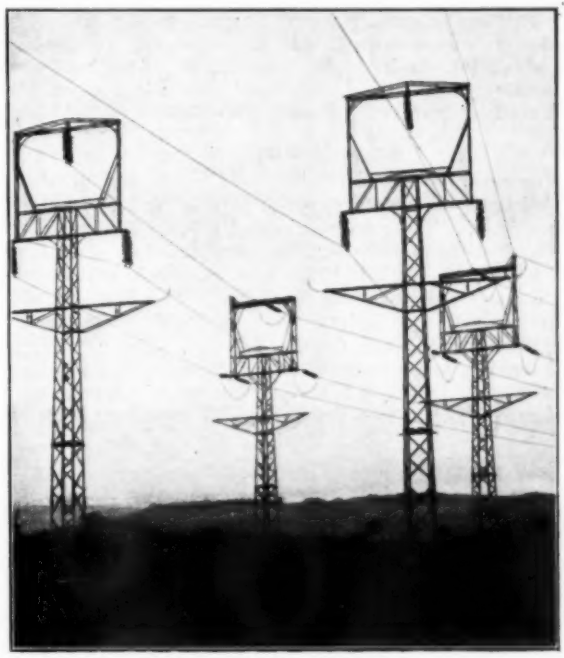


Fig. 7.—Transmission Line at Road Crossing.

The alternators each have an output of 5,720 kVA and are wound for 50 periods, 5,500 to 6,200 volts. They are of a type developed by the General Electric Co. of America; the first two were made in the United States, the others being constructed to the same design by the French Thomson-Houston Co., the contractors for the electrical equipment.

The rotor has a diameter of 4.88 metres (approximately 16 ft.), which at 107 revs. gives a peripheral speed of 90 ft. a second. The rotor wheel is of cast steel, the poles being built up of steel laminations; the rotor is designed to withstand a speed 2.1 times the normal. The windings are of the former type, placed in open slots, and have been tested at 13,000 volts. The neutral points of the star-stator windings are connected direct to earth. An 80-kW exciter, 250 volts, is placed above each alternator; regulation of the alternator is carried out by variation of the exciter voltage. A voltage relay operated from the potential transformer of the alternator, working a contactor, short-circuits part of the rheostat of the exciter fields and reduces the voltage of the alternator to a low value after each opening of the main circuit breaker.

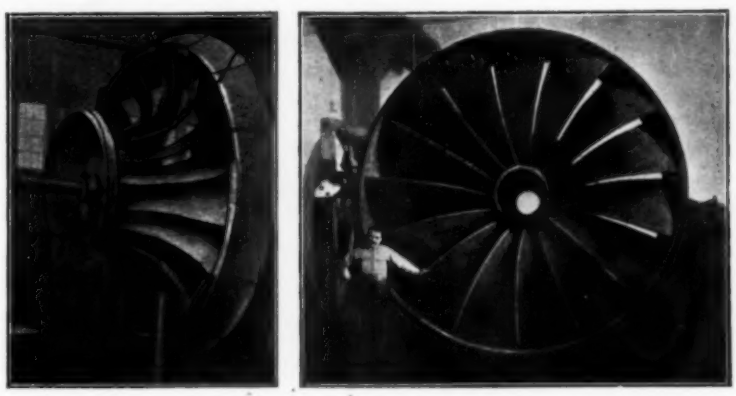


Fig. 8.—Two Views of the Turbine Wheel.

The main switchboard floor has the alternator operating desks for the 6,000-V oil switches. The connections to the alternators are of bar copper supported on insulators. There are two sets of bars; the oil switches can be released by maximum or differential relays. The low-pressure side of the step-up transformers can be connected to either set of bars. There are two 260-kVA, 3-phase transformers, 6,000/220 volts, for the operation of the traveller and other auxiliary motors. The 6,000-volt switches are of the G.E.C. (America) type, designed to break 90,000 kVA per pole. Each phase has two separate cylindrical oil containers placed in a separate cell made of insulating material.

### Step-up Transformers.

The main transformers are placed out of doors under a skeleton steel structure, which carries the h.p. insulators (fig. 9). There are two sets of 120,000-V bars, and each of the two lines can be connected to either set by means of section links and a switch connected to each. The outdoor bus-bars are made up of aluminium-steel cable hung on to a double set, each of eight "Hewlett" insulators.

There are four groups of transformers, each made up of three single-phase, 3,333-kVA units. The primary pressure is 5,500 to 6,200 volts, and secondary 55,400 to 69,200 volts; the primaries are connected in delta and the secondaries in star with the neutral direct to earth, each group therefore giving the pressure required for the 120,000-V line. The transformer tanks are cylindrical, 2.15 metres (7 ft. 6 in.) in diameter, 4.70 metres (15.5 ft.) high, and 6.40 metres (about 21 ft.) to the top of the insulators.

The transformer oil is cooled by means of a water coil made of copper pipes. A dial thermometer, connected with the oil in the upper central part of the tank by means of a flexible pipe, is placed on the outer wall of the tank. Each transformer is fitted with a compensator and an air dryer connected with the space above the oil level. A safety device is arranged, consisting of a sloping pipe attached to the cover, which ends in a flexible diaphragm; should any excess pressure be developed inside the tank, the diaphragm bursts and allows the excess oil to escape.

Great care was taken in the installation of the transformers; the windings were dried by means of the circulation of hot air in a special chamber by a motor-driven fan, the air being filtered before entry and heated by a 25-kW heater. The oil itself was dried by a 65-kW, 3-phase resistance heater. Special oil-testing transformers, with disk electrodes and motor-driven portable filter presses, were supplied by the French Thomson-Houston Co. for use with these transformers. The terminals are of the condenser type. The oil switches, fig. 6, are of a type developed by the General Electric Co. of America. Each pole is in a separate tank, each tank having an insulated lining. The switches are designed to break 2,400 amperes at 135,000 volts. The operating and trip gear, which is controlled from the main switchboard, is worked by d.c. at 125 V.

For the protection of the transformers, differential relays are arranged which trip the switches simultaneously on the h.p. and l.p. sides. The transformers are connected to the h.p. bus-bars through the above-mentioned h.p. switches, and the two feeders are connected to the bars by means of oil switches with maximum relays. For the operation of the relays, and in the case of the feeder switches for the supply of current to ammeters as well, series transformer coils are placed round the oil-filled inlet and outlet porcelain insulators of the 120,000-V switches, as can be seen from fig. 6.

For the protection of the line against disturbances, aluminium electrolytic dischargers have been installed of the type developed by the General Electric Co. of America. There are four dischargers on each line, three connected by horns to the line and the fourth connected between the neutral point of the first three dischargers and the earth. Each set consists of two columns of aluminium cones in series in an electrolyte, the whole being contained in an oil-filled tank. The hydroxide film is reformed daily by passing current through carborundum resistances, the operation being made simultaneously for the three phases with the aid of interlinked connectors mounted on insulators.

Although subjected from time to time to heavy surges and discharges due to storms (in two cases breakages of line conductor and earth conductor respectively have been attributed to direct lightning strokes) the electrolytic dischargers have given perfect protection. Monsieur Limousin, the local director of the Basse-Isère Co., in the house journal of the French Thomson-Houston Co., of Paris, in the November-December number, has given interesting details regarding the operation of the transformers, oil switches and electrolytic dischargers adopted for this installation.

*(To be concluded.)*

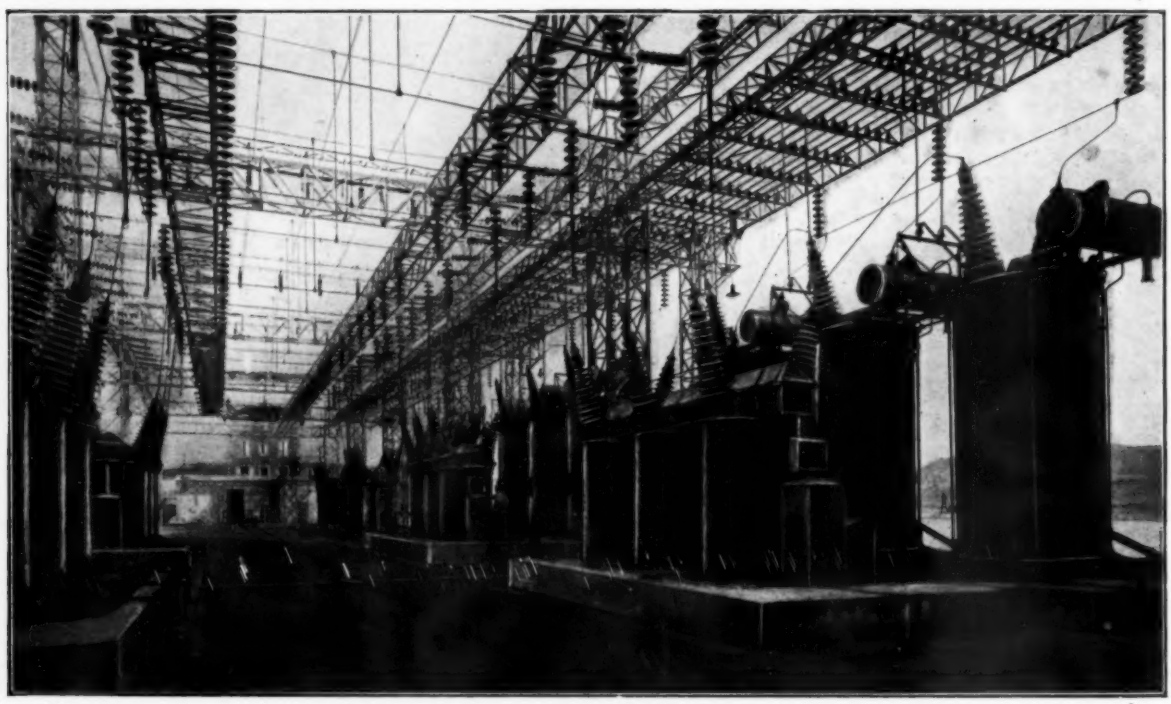


Fig. 9.—Outdoor Transformer and Switching Station.

# Tramway and Railway Notes.

(*Continued from page 794*)

**Burnley.**—Mr. H. Mozley, Burnley tramway manager, has sent an appreciative letter to all the men who volunteered for service during the general strike. Suitable volunteers desiring to join the regular staff will take precedence of those candidates now on the waiting list when vacancies arise.

**Liverpool.**—NEW DEPOT.—The foundation stone of the Corporation tramway works, which will cost £385,000, was laid recently. The area of the site is 15½ acres; tramlines on premises will be 3¼ miles; and the constructional steelwork will weigh 3,000 tons. The design of the works was prepared by the tramway general manager, Mr. P. Priestly, who has laid out the whole scheme. The rolling stock of the Corporation consists of nearly 800 vehicles, comprising tramcars, motor 'buses, motor cars, tower wagons, &c. The works, when completed, will be capable of employing at full strength about 1,000 men.

**New Zealand.**—RAILWAY ELECTRIFICATION.—According to the *Australasian Electrical Times*, proposals for the electrification of the suburban lines running from Wellington, Auckland and Dunedin, are now being examined by the electrical and mechanical engineers of the Railways Department. It is intended for the present to electrify the Lyttelton Tunnel line at Christchurch. Arrangements are being made for the calling of tenders to carry out the work which will be put in hand without delay.

**Southern Railway Electrification.**—*The Times* reports that the Southern Railway intends to adhere to the programme for the opening of the electrified lines from Charing Cross and London Bridge to Dartford *via* Woolwich, Bexley Heath, and Sidcup, on June 6th, and to proceed with the reconstruction of the lines and platforms at Cannon Street Station, which will be closed, as announced, from June 5th until June 26th. It is more than probable, however, that the services will be restricted, owing to the coal stoppage.

**United States.**—PITTSBURGH.—According to the *Electric Railway Journal* another step toward providing Pittsburgh with a rapid transit system has been made by a report recently submitted to the City Council by the City Transit Commission. It approves the immediate construction of the first part of the rapid transit system recommended by Mr. D. L. Turner, consulting engineer, and Mr. W. Haydock, chief engineer, of the Department of City Transit. The sections approved are a subway from the vicinity of Federal and Ohio Streets on the north side, *via* Federal Street and Fifth Avenue to Neville Street, in the Shadyside district, to be used by rapid transit trains, and another subway, less than a mile in length, on Grand Street, in the downtown section, to be used temporarily by surface cars. Later, this would form part of a rapid transit line. The City Transit Commission recommends the construction of these lines by the city and their lease to the Pittsburgh Railways under contract. Under this contract the railway would supply the rolling stock, electrical equipment, &c. The city's contribution would be $36,000,000 and the railway's $4,860,000. The Commission recommends a referendum at the next election on the question of authorising the city to float an issue of bonds to the amount of $30,000,000.

# Telegraph and Telephone Notes.

**Australia.**—TELEGRAPH SERVICE.—So soon as the route of the new road from Sydney to Newcastle is decided, the Post Office authorities are to lay a telegraph cable between those two towns, which will provide for at least 100 direct lines between the two cities. That scheme will cost £250,000. Meanwhile valve amplifiers on the line between Sydney and Melbourne are to be used to give some relief on the Sydney-Newcastle lines. By this system one line can be used for ten messages simultaneously.

AUTOMATIC TELEPHONY.—There has been a large increase in the use of the telephone service in New South Wales. The subscribers now number 114,182, as compared with 92,329 two years ago, and the problem so far as Sydney is concerned is the building and equipment of exchanges. Each costs about £200,000, being of the automatic type, and new exchanges in the suburban areas are also automatic.

**Egypt.**—WIRELESS CONCESSION.—It is understood that General Manifold, acting on behalf of Marconi's Wireless Telegraph Co., Ltd., has secured a 30 years' concession from the Egyptian Government to conduct a radio-telegraph service in Egypt.

**Hungary.**—TELEPHONE IMPROVEMENTS.—The Hungarian Post Office is to spend a large sum on improvements, including the reorganisation of the Budapest telephone system. It has been decided to introduce an entirely new automatic system. The Budapest system, with three exchanges, is now sufficient for 37,000 subscribers, which figure is to be increased by two stages to 65,000, and the service will be improved by laying subterranean cables. The sums required by the Post Office for the realisation of the plan will be loaned by the State.—*Reuter's Trade Service* (Budapest).

**Spain.**—TELEPHONE CONSTRUCTION.—The Compañía Telefónica Nacional de España, to which the practical control of the telephone systems of Spain has been granted, has decided to enter upon a wide programme of new construction. In addition to a further line between Barcelona and Madrid, new circuits will be laid to Castellón, Valencia, and Tarragona, and a completely new circuit will be installed between Barcelona, Granollers, and Nataro. When the improvements and extensions are completed, Barcelona will have six new circuits to Madrid, two to Bilbao, three to Zaragoza, and one to San Sebastian.—*Reuter's Trade Service* (Madrid).

**The Telegraph Service.**—PRESS TELEGRAMS.—Lord Wolmer recently stated in the House of Commons that the revenue from Press telegrams last year was £84,000, and the expenditure amounted to £330,000.

# Radio Notes.

**Canada.**—AMALGAMATION.—All the broadcasting stations in Canada have recently amalgamated under the name of the Canadian Association of Broadcasters. By means of general co-operation and relaying it is hoped to improve the general standard of the programmes.

**Germany.**—REVISED REGULATIONS.—Recent changes in the radio regulations cancel the requirements that apparatus be tested and marked by the Federal post office, and manufacturers are no longer required to submit a sample of every series of receivers built; listeners are no longer required to be members of an approved radio club. According to *Commerce Reports* a reduction in the amount of manufacturers' licence fees has also been made.

**Irish Free State.**—IMPORTED APPARATUS TAX.—In Dail Eireann, when the consideration of the Budget resolutions was on, Major Bryan Cooper tried to have the tax on wireless apparatus reduced from 33⅓ to 5 per cent., because the high duty was calculated to check the progress of a new industry. Mr. J. J. Walsh, Minister for Posts and Telegraphs, defended the imposition of the 33⅓ per cent. tax as being one means of bringing crystal sets within the reach of everyone. It was calculated that the revenue from licences would amount to £20,000, and, with the revenue from the tax on imported sets, he believed that he would later on be justified in asking for the necessary funds to equip three extra wireless stations in the Free State with a power equivalent to that of the Dublin station. The proposed new stations would in due time bring everyone in the country within crystal radius.

**Japan.**—AMALGAMATION.—Now that the novelty of wireless is said to be wearing off, there seems little to broadcast, and, the gramophone being more popular, the Government is reported to be attempting to amalgamate the Tokio, Nagaya, and Osaka stations.

**Licences in France.**—DELAYED ISSUE.—Mr. Harry Day, M.P., has received from the Foreign Office a reply to a question he raised about delay in granting licences for receiving sets to British subjects resident in France. The British Ambassador at Paris has been informed by the French Government that it is only in very exceptional cases that licences have been refused. Although the French reply does not give any reasons for the delay in the grant of licences, says the *Financial News*, Lord Crewe has since heard that several British subjects, resident at Le Havre, who had hitherto been unable to obtain their licences, have now all received them.

**United States.**—LABOUR AND WIRELESS.—The weekly bulletin of the International Federation of Trade Unions contains the following:—The Chicago Federation of Labour has obtained permission from the City Council to erect a broadcasting station and aerial at the municipal pier, which was formerly used as a wireless station by the American Navy. The Labour movement will finance and control the station, which is intended to counteract the anti-Labour propaganda of the local newspapers and also to transmit messages to Labour centres in the United States of America and abroad. The local Typographical Union has voted 10,000 dollars for the station, and the Chicago Federation of Labour suggests that local unions raise a levy of two dollars per member; one-half of the sum so collected to be used to purchase and erect the station and the other half to endow its permanent maintenance.

In Holland the Workers' Wireless Association, which hires the national wireless station one evening each week in order to conduct its own propaganda, seized the opportunity last week of broadcasting in English, French, and German reports received from the International Transport Workers, the International Federation of Trade Unions, &c., on the situation in Great Britain.—*Reuter* (The Hague).

DRASTIC INTERFERENCE LAW.—A recent occurrence in Nebraska indicates the drastic extreme to which some city councils are likely to go in attempting to prevent radio interference, when complaint is made by even a few irritated listeners. Just three such persons, alleging that their trouble was due to the Central Power Company's transmission lines, were able to convince the Mayor of Grand Island and the City Council that an ordinance should be passed compelling the Company to remove all of its 33,000-volt lines from the city within 90 days. Because of enlightenment of the City Council by a broadcast listeners' league, the *Electrical World* expects that the ordinance will be repealed.

CONTROL OF RADIO.—The Senate Interstate Commerce Committee has approved the Dill Radio Bill providing for a commission to have control of air communication. The Commission would have supreme power in its field, the Committee having eliminated a provision for appeals to the courts to compel the issuing of broadcasting licences, or prevent the rescinding of them. The Bill's supporters hope to get it passed this session, holding that recent court decisions have made immediate legislation imperative.—*Reuter's Trade Service* (Washington).

# Contracts Open and Closed.

**(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)**

## Open.

**Australia.**—MELBOURNE.—June 28th. Electricity Commission of Victoria. 22,000-V transformers and spares (B.X. 2528).*

June 16th. Victorian Government Railways. One heavy-current motor generator set. (B.X. 2527).*

June 16th. City Council. Turbo-alternator, exciter and condensing plant.*

August 11th. H. and l.p., 3-phase sub-station switchgear.*

August 3rd. Postmaster-General's Department. Telephones and dials.*

BRISBANE.—August 26th. City Electric Light Co., Ltd. One 12,500-kW turbo-alternator.*

**Canada.**—June 2nd. Department of Public Works. One 25-ton electrically-operated portal crane for Esquimalt Dry Dock.*

**Belfast.** — June 12th. Electricity Committee. D.c. switchgear for sub-stations and transformer kiosks. (See this issue.)

**Bristol.**—June 14th. Electricity Department. Additions to the premises at Feeder Road generating station. (See this issue.)

**Dublin.**—June 3rd. Great Northern Railway (Ireland). Six months' supplies of stores, including electrical fittings, lamps, cable, wire, &c. (May 14th and 21st.)

**Eccles.**—May 31st. Electricity Department. Twelve months' supply of single-phase a.c. house-service integrating watt-hour meters. (May 14th and 21st.)

**Egypt.**—CAIRO.—June 30th. Ministry of the Interior. One Diesel engine, direct coupled to an 80-kW generator, complete with switchboard. (B.X. 2537).*

June 19th. Minister of Education. Dynamo and motors.*

Egyptian State Railways, Telegraphs and Telephones. Underground cables. Chief Inspecting Engineer, Queen Anne's Chambers, Broadway, Westminster, S.W.1.

**Erith.**—June 7th. Electricity Department. L.p. cables. (See this issue.)

**Epsom.**—June 14th. Electricity Department. Removal of boilers and setting them up as fuel tanks, overhead travelling crane, two 300-kW Diesel engine-driven generators and accessories, oil-purifying plant and cooling tower. (See this issue.)

**Glasgow.**—June 2nd. Corporation. Electric lighting installations at Wellmeadow and Cathcart Road housing schemes. Particulars from Mr. R. B. Mitchell, Corporation electrical engineer.

**Harrogate.**—May 31st. Electricity Department. Electricity meters (British make) for six months. (May 14th and 21st.)

**Hull.**—Telephone Committee. Copper jointing sleeves. (May 7th.)

**India.**—June 15th. India Store Department. 70,000 (approx.) copper bonds for track rails. (May 14th and 21st.)

June 11th. Wireless transmitting sets. Particulars from Department, 11, Belvedere Road, S.E.

**Kettering.**—June 9th. Electricity Department. Water-softening plant. (May 14th and 21st.)

**London.**—BETHNAL GREEN.—June 4th. Borough Council. Electric lighting and power installation at Bethnal Green Hospital. (May 14th and 21st.)

June 16th. Metropolitan Asylums Board. Installation of electric cable for arc light treatment apparatus at St. Luke's Hospital, Lowestoft. (See this issue.)

**Manchester.**—June 1st. Board of Guardians. Two electric hospital bed lifts, Withington Hospital; one ditto, Crumpsall Infirmary; and one electric passenger lift, Union Offices, All Saints. Particulars from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints, Manchester.

June 4th. Electricity Committee. Two portable air compressors for High Street Depôt. Specification from Mr. H. C. Lamb, manager, Electricity Department, Town Hall.

June 5th. Renewals and additions in connection with X-ray plant at Booth Hall Infirmary, Charlestown Road, Blackley. Specifications from Mr. F. W. Greenhalgh, clerk to Board of Guardians, Union Offices, All Saints', Manchester.

**Middlesbrough.**—Electricity Department. Extension of electricity supply distributors, total length approx. 1,000 yd. (April 30th.)

**New Zealand.**—AUCKLAND.—June 21st. Electric Power Board. L.p. insulators, &c.*

Public Works Department. July 20th. Phase transformer for Mangahao electric power scheme.*

New Zealand Railway Department. June 16th. Electric motors.*

August 30th. 400-V, 3-phase, slip-ring induction motors and starters.*

**Normanton.**—June 1st. Urban District Council. Feeder and distribution cables, feeder pillars, and one 200-kVA transformer. (May 14th and 21st.)

**Nottingham.**—May 31st. Board of Guardians. One 60-kW d.c. turbo-generator, &c., and alterations to main switchboard, &c. (April 16th.)

**Otley (Yorkshire).**—June 2nd. Electric lighting at new public slaughterhouses at Station Road. Particulars from Mr. C. J. F. Atkinson, Clerk to the U.D.C.

**Rhyl.**—June 16th. Electricity Department. 1,000 yd. l.p. armoured cable, 1,915 yd. 11,000-V feeder cable, and switchgear equipment. (See this issue.)

**Roumania.**—BUCHAREST.—June 8th. Bucharest Tramway Co. 10 000 kg. electrodes, 1,000 kg. electrolytic copper, 3,000 electrolytic copper contact pieces, 1,200 kg. copper plates, 200 kg. brass sheets, 2,500 kg. black insulating varnish.*

**South Africa.**—June 21st. South African Railways and Harbours. Track bonds for the Cape Town Suburban Railway electrification scheme. (See this issue.)

June 3rd. South African Railways and Harbours. One motor-starting panel.*

June 10th. D.c. electric generating plant (suction gas).*

JOHANNESBURG.—Municipal Council. 8 miles h.p. cable, 41 miles l.p. cable.*

**Southern Rhodesia.**—June 21st. Department of Posts and Telegraphs. Automatic telegraphs. Automatic telephone exchange for Salisbury. (April 23rd.)

**Stoke-on-Trent.**—June 9th. Electricity Department. Two 60,000-lb. per hour water-tube boilers. (May 14th and 21st.)

**Uruguay.** — MONTEVIDEO. — July 6th. State Electricity Works. 1,000,000 metres of insulated conductors. (B.X. 2523).*

July 9th. 137,500 metres rubber-insulated wires and cables. (B.X. 2548).*

40,000 metres of coloured twin conductor cords. (B.X. 2549).*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

## Closed.

**Australia.**—MELBOURNE.—Electricity Supply Committee. Accepted:—

Armour-clad switchgear (£19,985).—A. Reyrolle & Co., Ltd.
Spare turbine parts (£650).—Metropolitan-Vickers Electrical Co., Ltd.

SYDNEY.—Electricity Supply Committee. Recommended:—

Maximum demand indicators (£1,635).—Edison Swan Electric Co., Ltd.
Armour-clad switchgear for sub-station (£104,693), six sets of current transformers (£227), six Fawssett-Parry relays (£192), two 10,000-V feeder panels (£326).—Metropolitan-Vickers Electrical Co., Ltd.
Double-braided weather-proof cables (£4,792).—Enfield Cable Works (Aust.), Ltd. *Tenders.*

**Barton-upon-Irwell.**—Board of Guardians.—At the meeting of the Guardians last week, protests were made, says the *Daily Dispatch*, against the acceptance of the tender of Bell Bros., of London, at £8,430, for electrical work at the new hospital at Davyhulme. The Ministry of Health had sanctioned the borrowing of £8,430 for the purpose, and it was pointed out by the clerk that the accepted tender was the lowest. Offers from Manchester firms were as high as £10,000. Several members of the Board thought the contract should have been given to a local firm. After considerable discussion, the tender from Messrs. Bell Brothers, recommended by the Ministry, was accepted, with the proviso that local labour should be employed as far as possible.

**Belgium.** — German, Belgian, Dutch and British (Callender's Cable & Construction Co., Ltd.) firms recently submitted tenders to the Belgian State Railway authorities in Brussels, for the supply of 101 kilometres of insulated cable in two lots of respectively 11 and 90 kilometres. For both lots, the lowest offers were those of Belgian concerns.

**Bury St. Edmunds.**—Town Council. Accepted:—

Boiler (3,850 sq. ft. heating surface), with superheater.—Babcock and Wilcox, Ltd.

**Corsham.**—Parish Council. Accepted:—

Installing electric light at the Town Hall.—Edwards & Armstrong.

**Croydon.**—Electricity Committee. Recommended:—

Switchgear (£507).—Metropolitan-Vickers Electrical Co., Ltd.
Water-softening plant (£1,150).—Becco Engineering and Chemical Co., Ltd.

**Edinburgh.**—Corporation. Accepted:—

12 months' supply of single-phase meters.—Edison Swan Electric Co., Ltd.

**Hazel Grove and Bramhall.**—Urban Council. Accepted:

Mains extensions in the Woodford Fringe area (£1,209).—W. T. Glover and Co., Ltd.

**Irish Free State.**—DUBLIN.—Ministry of Local Government and Public Health (Trade Section).

Contracts for supplies to local authorities for 6 months :—

Vacuum draw wire, M.F. electric lamps, one-watt type, 10 to 100 watts.—Briscoe Importing Co.

Spiral vacuum lamps, half-watt type, 30 to 100 watts, 50 to 200 V.—Sphinx Electric Co.

—*Irish Builder and Engineer.*

CITY COMMISSIONERS. Accepted :—

Switchgear for Pigeon House and Fleet Street stations (£4,705 and £6,369).—Ferguson, Pailin, Ltd.

**London.**—STEPNEY.—Electricity Supply Committee. Recommended :—

Meters and combined meters and demand indicators for 12 months :—2½ to 25 amp. meters (£7,238).—Reason Mfg. Co., Ltd.

Prepayment meters (£672) and 50 and 100 amp. meters (£229).—Ferranti, Ltd.

Combined meters (£363).—Aron Electricity Meter, Ltd.

Time switches for 12 months (£1,200).—Venner Time Switches, Ltd.

Conduits and troughs and covers for 12 months (£3,111).—Albion Clay Co., Ltd.

Wiring L.C.C. tenements, Willoughby House, Dundee Street, Wapping (£394).—L. G. Tate & Co., Ltd.

7,570 fuse boxes (£1,084).—W. T. Henley's Telegraph Works Co., Ltd.

**Rotherham.**—Corporation. Accepted:—

Paper-insulated taped and armoured cables.—Edison Swan Electric Co., Ltd.

**Shipston-on-Stour.**—Board of Guardians. Accepted:—

Installing electric lighting at the casual wards.—Shipston New Electric Lighting Co.

**Southend-on-Sea.**—Town Council. Accepted:—

1,450 current limiters (£1,160).—Chamberlain & Hookham, Ltd.

## Forthcoming Events.

**Illuminating Engineering Society.**—Tuesday, June 1st. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7 p.m. Discussion on "Research in Illumination," to be opened by Mr. J. W. T. Walsh.

**Roentgen Society.**—Tuesday, June 1st. At 32, Welbeck Street, W. At 8.15 p.m. Ordinary meeting.

**Institution of Electrical Engineers (Wireless Section).**—Wednesday, June 2nd. At Savoy Place, Victoria Embankment, W.C. At 6 p.m. Paper on "Low-frequency Intervalve Transformers," by Mr. P. W. Willans.

## Notes.

**Northern Ireland Power Resources.**—The Development Commission appointed by the Government of Northern Ireland to investigate the natural and industrial resources of Ulster has submitted a report to the Government, recommending the increased use of electrical power and the electrification of railways. The Commission's recommendations include the granting of additional powers to the Electricity Commissioners, financial assistance to new schemes, the expansion of the power stations of the Belfast and Londonderry undertakings, and the utilisation of the River Bann and the tides of Strangford Lough. The report will be dealt with more fully in a later issue.

**The Yallourn Scheme, Australia.**—The report of Mr. Willetts Sawyer, the American expert, upon the Yallourn (Victoria) electricity scheme has been published; according to the *Financial News*, it declares that the scheme is fundamentally sound, but recommends the postponement of the expenditure of half a million sterling authorised by Parliament until modern methods have been investigated. The report also recommends the appointment of Mr. Clements, managing director of the Melbourne Electric Supply Co., as an additional Commissioner, which post the Government has asked Mr. Clements to accept. Mr. Sawyer reports against the extension of the briquetting plant.

**Tramways and Light Railways Association.**—ANNUAL CONGRESS.—The programme of the annual congress of the Association, to be held at Torquay from June 23rd to 26th, commences with an informal reception by the directors of the Torquay Tramways Company on Wednesday evening, June 23rd. On Thursday the Mayor and members of the Corporation will formally receive the visitors at the Town Hall, and afterwards Mr. L. M. Myers will read a paper on "Competition of Motor Omnibuses with Tramways." The Mayor and Corporation will entertain the members at luncheon, and in the afternoon there will be an excursion to Widdecombe. On Friday the annual meeting of the Association will be held, and a report on "Tramway Rolling Stock" (by a Joint Committee of the two Tramway Associations) will be introduced by Mr. C. J. Spencer, O.B.E., and discussed. In the afternoon there will be an excursion to and on the River Dart, and in the evening the Association will be entertained at dinner by the directors of the Torquay Tramways Co.

**Depreciation of Railless Trolley Cars.**—The Principal Inspector of Taxes, after a conference with representatives of the Tramway Associations, has made an offer that the annual allowance for depreciation should be 15 per cent. on the written-down value of railless cars, in addition to obsolescence, the arrangement to continue for a period of five years. The Council of the Tramways and Light Railways Association recommended the acceptance of this offer to its members.

**A Large Diesel Engine.**—What is claimed to be the largest Diesel engine so far constructed, is at present being installed in the Neuhof power station at Hamburg of the Hamburg Electricity Supply Co. The engine, which has been built by the Blohm and Voss Co., of Hamburg, to the designs of the Augsburg-Nuremburg Maschinenfabrik, is of the two-stroke type and comprises nine cylinders with a bore and stroke of 860 by 1,500 mm. The engine, which is expected to develop 15,000 h.p. at 54 r.p.m., is 76 ft. long, 14 ft. wide, and 38 ft. in height.

**Fatalities.**—While on a bird-nesting expedition, an 11-year old Barnsley boy, Arthur Wilfred Lane, climbed a pole carrying a transmission line from the Yorkshire Electric Power Company's works at Barugh, and came in contact with the line. He received severe burns and died in hospital later. At the inquest recently, John Willison, operation superintendent in the employ of the Power Company, suggested that the boy made contact with the earth wire on which he was standing and the box terminal. This short circuit would cause a huge flame, but no current would pass through the boy's body. The voltage was 11,000.

On May 22nd, an inquest at the St. Pancras Coroner's Court was held on Arthur Henry Jeffreys (52), who died as the result of a fall from a staging in the St. Pancas electricity works. The deceased was employed by International Combustion, Ltd., and was engaged on the erection of a new bunker. A verdict of accidental death was recorded.

**Illuminating Engineering in Italy.**—Under the auspices of a number of leading Italian electrical engineers, an Italian National Association for the Development of Illumination has recently been organised in Milan. The object of the new body, which it is hoped will receive the financial support of electric lighting undertakings throughout Italy, as well as electrical engineering firms, is to promote the study of improved means of public and private lighting with the purpose of developing the further use of electricity for illuminating purposes. The Hon. Signor Motta has been elected president of the new association, whose offices are temporarily at those of the Edison Co., in Milan, while Signor Carlo Clerici has been appointed director.

**Technical Education.**—In his presidential address to the Association of Teachers in Technical Institutions at its annual conference, on May 24th, Mr. A. E. Evans, B.Sc., outlined the objects of the Association and defended technical education and training centres. All forms of education, he said, are not separate entities, but merely aspects of one indivisible whole, education. The recent Coal Commission deplored the lack of adequate facilities for research into the methods of winning and utilising coal. Electricity Commissioners might formulate comprehensive schemes for the supply of power; the skilled engineer educated at our technical colleges and schools would interpret these schemes in the light of engineering practice.

**Appointments Vacant.**—Charge engineer, for the South Lancashire Tramways Co.; junior assistant engineer for the Borough of Newport (Mon.) Electricity Department; general fitter (electrical) (90s.) for the Southwark Hospital, East Dulwich Grove, S.E. Assistant secretary (£551 approx.), for the City of Birmingham Electric Supply Department. (See our advertisement pages to-day.)

**Electrical Refrigeration in America.** — According to statistics collected by the McGraw-Hill Publishing Co., the number of manufacturers of electrical refrigerators in the United States has increased from five to fifty within a few years and twelve fresh firms have just taken up this branch of production in anticipation of the coming summer demand. The number of electrical refrigerators in use in American homes has increased from 3,000 to over 142,000 within the last six years, and approximately 75,000 were sold during 1925. About 200 homes substituted the electrical appliance for the ice box in 1925, and it is confidently anticipated that the number will reach 500 in 1926. Pointing out that at the present rate of development the next few years will see several million homes solving their refrigeration problems by electricity, Mr. Arthur Williams, of the New York Edison Company, recently said: "Six years ago household refrigerators occupied a position analogous to that occupied by the automobile in the early days of the automotive vehicle industry. It was only in 1923 that electric refrigerators began to be considered a household convenience within the reach of almost any American family and in that year alone more than four times as many homes were equipped with electric refrigerators as during the previous ten years." The great strides taken in the last few years towards transforming the household refrigerator into another electrical appliance for the home, reducing refrigeration costs and increasing its efficiency, are largely due to the efforts of power station companies throughout the country. To-day the smallest of the three leading companies in the electric refrigerator business has a paid-up capital of $5,000,000.

**High-Pressure Rectifier Plant.**—From an illustrated leaflet issued by Messrs. Brown, Boveri & Co., we obtain the following particulars of a 4,000-V (d.c.) power-rectifier plant which is claimed to be the only equipment of that description in existence designed for such a high d.c. pressure. The normal output is 800 kW with an overload rating of 25 per cent. for 30 min. and 200 per cent. momentarily. It is claimed to have an overall efficiency of 97.5 per cent. The plant is installed in Italy at the Ciriè sub-station of the Turin-Lanzo-Ceres Electric Railway and is used to convert 3-phase energy at 36,000 V to d.c. at 4,000 V.

**The International Tramway Congress.**—The 20th annual congress of the International Union of Tramways, Local Railways and Public Motor Transport Services is to be held in Barcelona in October next. Among the subjects to be discussed in the electrical section are the standardisation of traction motors, electric transformer stations, mercury rectifiers, and remote control.

**Stepney and the Strike.**—At a meeting of power users in the borough of Stepney last week, a committee was formed to inquire into the circumstances of the stoppage of the electricity supply from the Council's station during the strike and to report with a view to the institution of legal proceedings against the Council.

**A Link with the Atlantic Cable.**—Replying to an inquiry in the *Overseas Daily Mail* for news of survivors of the voyage of the s.s. *Great Eastern* when she was engaged in laying the Atlantic Cable, in 1866, Mr. William Cuming, of St. Albans, New Zealand, wrote to the *Daily Mail* of May 19th, stating that he was employed as an extra engineer, attached to the staff of the screw department. "The engineering staff of the ship, both for paddle and screw, were under the supervision of Mr. Beckwith as chief. The scientific staff included Captain James Anderson, Professor Thomson (afterwards Lord Kelvin), Daniel Gooch, Cyrus Field, Glass, and others, afterwards knighted for eminent services. I regret that I at 86 am very nearly the last survivor of an expedition which aroused the deepest interest in the mechanical world."

**An American Electrical Leader Dissatisfied.**—In an article upon Mr. James E. Davidson, the president of the (American) National Electric Light Association, appearing in *Electrical Merchandising*, it is stated that Mr. Davidson considers that "the electric light and power industry should stop preening itself over its size and think of the absurdly small amount of its sales to the average home. He believes that a capital investment turnover of once in five years, compared with the five turnovers a year of the successful merchant, is a reproach to electrical men. He believes that load factors of 30 and 40 per cent. are something not to be put up with but to be overcome by ingenious selling, just as the telephone and telegraph companies have largely solved their problems with night message offers." It is further stated that "what the household wants is not raw kilowatt-hours, but help in washing, ironing, refrigerating, cooking, heating, cooling, lighting and so on, human service that can only be rendered when appliances are installed." Accordingly, Mr. Davidson calls upon the central station industry to improve its business-getting and appliance-selling organisation.

**Electrical Association for Women.** — The luncheon arranged in connection with the first annual general meeting of this Association will take place at the Hotel Cecil, London, on Friday, June 4th, at 1 p.m. (not at the Criterion Restaurant as previously arranged). Lieut.-Col. Wilfrid Ashley, M.P., Minister of Transport, and Sir Hugo Hirst, Bart., have again promised to speak on this occasion.

**A Strike Sequel.**—According to the *Daily Dispatch*, Mr. A. R. Fearnley, general manager of the Sheffield Corporation Tramway Department, has issued writs for alleged libel against representatives of the Sheffield Trades and Labour Council and the printer of a strike bulletin issued by that body. The action arises out of a statement complaining of the way in which it was alleged Mr. Fearnley conducted, during the strike, a ballot of the Sheffield tramwaymen on whether they would return to work. The writs have been issued against Councillor E. G. Rowlinson, A. Barton, H. Gascoigne, and T. Garnett, officials of the Trades and Labour Council, and P. Williams, the printer of the bulletin. A further writ for alleged libel and slander has been issued by Mr. Fearnley against C. J. Mitchell, B.Sc., of Woodhouse, Sheffield.

## Institution Notes.

**Institution of Electrical Engineers.**—SUMMER MEETING POSTPONED.—It has been decided, on account of the recent general strike and in view of the situation in the coal-mining industry, to postpone the summer meeting which was to have taken place next month at the North-Eastern Centre until next year. It is hoped that the meeting will be held from June 14th to 17th, 1927.

WIRELESS SECTION COMMITTEE.—The under-mentioned gentlemen have been nominated by the Wireless Section Committee to serve on the Committee from October 1st, 1926:—*Chairman*: Prof. C. L. Fortescue. *Ordinary Members*: Major B. Binyon and Messrs. R. V. Hansford, S. R. Mullard, and G. Shearing. Not later than 14 days after the publication of the Committee's list of nominations, any five members of the Wireless Section may nominate any other duly qualified person to fill any vacancy. The following will continue to serve as members of the Committee: The President, I.E.E.; chairman of the Papers Committee, I.E.E.; a nominee of the Council, I.E.E.; a nominee of the General Purposes Committee, I.E.E.; Mr. P. R. Coursey; Prof. C. L. Fortescue; Capt. N. Lea; Mr. F. C. Phillips; Capt. H. J. Round; Mr. E. H. Shaughnessy; Commander J. A. Slee; and Mr. L. B. Turner, together with one representative each to be nominated by the Admiralty, Air Ministry, General Post Office, and War Office.

**Iron and Steel Institute.**—The postponed annual meeting of the above Institute is to take place on June 3rd and 4th at the Institution of Civil Engineers, Great George Street, London, S.W.1, when the programme already published will be adhered to as nearly as possible. The annual dinner, which may now necessarily be of an informal character, will take place at the Connaught Rooms, on June 3rd.

## Our Personal Column.

**(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)**

Mr. HARRY P. LAWSON, until lately a director of Messrs. Cole, Marchent & Morley, Ltd., has now accepted the position of sales manager to Messrs. Hick, Hargreaves & Co., Ltd., Soho Iron Works, Bolton. Mr. Lawson's long association with Messrs. Cole, Marchent & Morley, for whom he has acted as outside representative during the last fifteen years, has brought him into touch with municipal, company and industrial engineers throughout the country and we feel sure that his many friends will join with us in wishing him every success in his new position.

*Madame Yevonde* [*London.*

**Mr. Harry P. Lawson.**

Bedford Town Council is increasing the salary of the deputy electrical engineer, Mr. H. B. JENKINS, from £605 per annum to £625, from July 1st next.

In April, Mr. A. MALING, Australian manager of Metropolitan-Vickers Electrical Co., and Mrs. MALING, left Melbourne for Europe.

**Obituary.**—MR. H. W. BOWDEN.—As briefly announced in our last issue, Mr Henry White Bowden passed away on May 9th. Mr. Bowden began his electrical career at Wolverhampton, where he was articled as a pupil with Messrs. Elwell Parker. Two years as electrical engineer with the Eastbourne Electric Light Co. followed and in 1891 he took up the position of assistant manager to the House-to-House Electric Light Co. at Kensington (now the Brompton and Kensington Electricity Supply Co.). He was prominently connected with that company's affairs for very many years, during a period of continuous extension. He became a director of the old Blackheath and Greenwich Electric Light Co. (now the South Metropolitan Electric Light & Power Co., Ltd), in 1898, and supervised the erection of much of the plant of the South Metropolitan Co., of which he was managing director and engineer-in-chief. In 1906 he also joined the board of the Woking Electric Supply Co. Mr. Bowden was one of the pioneers of electricity supply in London and in these days, when so much is being done to bring electrical service within the compass of the general populace, it is interesting to recall that he was very early in the field with free-wiring installation arrangements which gave the consumer up to six points free of charge. Mr. Bowden resigned his position as engineer-in-chief of the South Metropolitan Company in 1919, also his seat on the board, but he continued as consulting engineer to the company. He was a member of the Institution of Civil Engineers and of the Institution of Electrical Engineers.

MR. F. S. SPIERS.—We regret to announce that Mr. Frederick S. Spiers, O.B.E., B.Sc., A.C.G.I., A.M.I.E.E., died suddenly on May 21st, at the early age of 50. Mr. Spiers was a consulting electro-metallurgist in private practice, but was very widely known as one of the founders of the Faraday Society, of which he was secretary and editor up to the time of his death; in those capacities he rendered invaluable service to the electro-chemical industry. He organised the exhibitions of British scientific products which were promoted by the

British Science Guild in 1918 and 1919, and took part in the formation of the Electroplaters' and Depositors' Technical Society last year. The electro-deposition of metals was perhaps his most engrossing study, but he was keenly interested in all branches of physical science, and for many years was a regular contributor to our columns, besides being a personal friend of long standing, whose loss we deplore.

DR. J. T. BOTTOMLEY.—We regret to record that Dr. James Thomson Bottomley, D.Sc., LL.D., F.R.S., F.R.S.E., F.C.S., of Netherhall, Largs, Ayrshire, nephew of the late Lord Kelvin, passed away on May 18th, at 13, University Gardens, Glasgow, in his 82nd year. He was a native of Ireland, and after graduating with distinction in 1866, Mr. Bottomley successively occupied teaching posts at Queen's College, Belfast, King's College, London, and Glasgow University, where from 1869 to 1907 he was lecturer in Natural Philosophy and assistant to Lord Kelvin, with whom he was closely associated for many years. In 1900 he became a partner in the well-known firm of Kelvin, Bottomley & Baird, and on the death of Lord Kelvin in 1907 he became chairman of the company, occupying that position until his death. Mr. Bottomley's bent was towards physical research; he was a member of the Institution of Electrical Engineers and of the Physical Society, and was the author of various works on physics and mathematics. His gentle disposition endeared him to the students of Glasgow University during his long period of service as deputy to Lord Kelvin.

MR. A. J. COLLIER.—The death took place on May 18th, at Horton Chapel, Chartham, near Canterbury, of Mr. Alfred John Collier, of the Eastern Extension Telegraph Co. He was 76 years of age.

Mr. ALLAN DE LUCE, charge electrical engineer at the Colne electricity station, passed away last week at the age of 27 years. He had been in the service of the department 10 years.

MR. F. MACKENZIE.—The funeral took place, on May 20th, at Preston Cemetery, of Mr. Francis Mackenzie, for many years representative of the English Electric Co., Ltd., on the Royal Infirmary Mills and Workshops Committee and for 11 years a Workpeople's member on the board of management. Among the wreaths was one from the employés of the English Electric Co.

**Wills.**—MR. J. S. AGAR, of Agar, Cross & Co., Ltd., left £152,868.

The late Mr. H. OPPENHEIMER left £12,415.

The late Mr. W. R. COOPER left £15,451 gross and £13,883 net personalty.

The late Mr. THOMAS W. WARD, of Sheffield, left £485,627 gross and £467,853 net personalty.

Mr. G. C. KENT, chairman of Messrs. Taylor, Tunnicliff and Co., Ltd., left £39,443 gross and £32,679 net.

# New Companies Registered.

**Upfields Wireless, Ltd.** (213,849).—Private company. Registered May 19th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of wireless apparatus, receiving and transmitting sets, accumulators, component parts and wireless accessories, &c. The permanent directors are:—W. B. Alexander, The Kites Nest, St. Helen's Park Road, Hastings; R. Butler, 26, Baldslow Road, Hastings; B. H. Blackman, 23, St. Helen's Crescent, Hastings. Qualification, 20 shares. Secretary: B. H. Blackman. Solicitor: W. E. F. Cheesman, 23, Havelock Road, Hastings.

**Shemelds, Ltd** (N.I. 330).—Private company. Registered in Belfast May 7th. Capital, £3,000 in £1 shares. Objects:—To carry on the business of general electrical and telephonic engineers, motor engineers, plumbers, gasfitters, &c. The first directors are:—W. I. Smith, 33, Cherryvalley Gardens, Knock, Belfast, electrician; and J. H. Tyler, 33, Linden Gardens, Belfast, electrician. Registered office: Raleigh House, Queen Street, Belfast.

**Northern Electric Supply Co., Ltd.** (N.I. 331).—Private company. Registered in Belfast May 10th. Capital, £12,000 in 7,000 ordinary and 5,000 preference shares of £1 each. To produce, store and supply electric energy and power in any part of the United Kingdom, Colonies, Dependencies, &c. The subscribers (each with one share are):—J. H. Graham, 111, Beersbridge Road, Belfast, audit clerk; and H. McCorry, Aughacommon, Lurgan, solicitor's clerk. The first directors are not named. Qualification, 100 shares. Secretary: A. Heggarty. Registered office: 1, Wellington Place, Belfast.

**Bergmann Electric Co. (Ireland), Ltd.** (7,490).—Private company. Registered in Dublin on May 12th. Capital, £5,000 in £1 shares. Objects:—To carry on the business of electrical engineers and contractors, suppliers of electricity, &c. The directors are:—J. D. Doyle, Mountain Villa, Ballybrack, consulting engineer; H. N. Roberts, 26, Sandford Road, Dublin, consulting engineer; and J. W. Hissink, 63, Seestrasse, Berlin, Germany, engineer. Secretary: J. K. Reilly. Registered office: 4, Saint Andrew Street, Dublin.

# Official Returns of Electrical Companies.

**London Factors and Agents, Ltd.**—A. Leonard, of 82, Victoria Street, S.W.1, was appointed receiver and manager on April 27th, 1926, under powers contained in charge dated February 28th, 1922.

**Peter Curtis, Ltd.** — S. W. Rowland, of 296-302, High Holborn, W.C.1, C.A., ceased to act as receiver or manager on May 11th, 1926. Satisfaction in full on May 11th, 1926, of debenture dated February 18th, 1925, securing all moneys due or to become due not exceeding £5,000.

Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated May 11th, 1926, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

**Paignton Electric Light and Power Co., Ltd.** (98,437).—Capital, £40,000 in £1 shares. Return dated April 7th, 1926. All shares taken up. £40,000 paid. Mortgages and charges, nil.

**Eddystone Components, Ltd.**—Debenture dated April 23rd, 1926, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Bird, 191, Preston New Road, Blackburn.

**Neutron, Ltd.**—Particulars filed of £3,300 debentures (including £1,300 already registered) authorised by resolutions of April 12th and May 4th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,900.

**Breeden & Co., Ltd.**—Debenture dated April 26th, 1926, to secure £15,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: British Brass Fittings, Ltd., 100, Moorsom Street, Birmingham.

**Spensers (London), Ltd.**—Particulars filed of £2,000 debentures authorised by resolutions of October 5th, 1925, and February 8th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

**Perfect Burglar Alarm Co., Ltd.** (112,522).—Capital, £4,000 in 1,000 preference and 3,000 ordinary shares of £1 each. Return dated February 9th, 1926. 230 preference and 1,710 ordinary shares taken up. £1,382 10s. paid, being £1 on 1,210 and 15s. on 230. £500 considered as paid on 500 shares. Mortgages and charges, nil.

**Sussex Electricity Supply Co., Ltd.** (175,686).—Capital, £20,000 in £1 shares. Return dated December 18th, 1925 (filed May 15th 1926). 18,049 shares taken up. £18,049 paid. Mortgages and charges, £10,000.

**Townlea Electrical Co., Ltd.** (189,297).—Capital, £1,000 in 300 preference and 700 ordinary shares of £1 each. Return dated December 24th, 1925. 500 shares taken up. £500 paid. Mortgages and charges, nil.

**Isle of Thanet Electric Supply Co., Ltd.** (49,978).—Capital, £360,000 in 150,000 ordinary and 210,000 preference shares of £1 each. Annual return dated December 31st, 1925. All shares taken up. £150,000 paid on 150,000 preference. £210,000 considered as paid on 60,000 preference and 150,000 ordinary. Mortgages and charges, £298,616. Return of allotments, dated May 17th, 1926, shows a further 72,000 preference shares allotted, payable in cash.

**City of Buenos Ayres Tramways Co. (1924), Ltd.** (82,214).—Capital, £1,240,000 in £5 shares. Return dated March 1st, 1926. All shares taken up. £1,240,000 considered as paid. Mortgages and charges, £172,167.

**Finston Manufacturing Co., Ltd.**—Particulars filed of £1,500 debentures authorised May 14th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

**Northampton Electric Light and Power Co., Ltd.** (28,640).—Capital, £350,000 in 10 "A" and 349,990 "B" shares of £1 each. Return dated March 4th, 1926. 10 "A," 304,723 "B" ordinary and 45,000 "B" preference shares taken up. £349,733 paid. Mortgages and charges, £200,000. In April, 1926, the capital was increased to £500,000 by the creation of 150,000 new shares of £1 each.

**Telegraph Construction and Maintenance Co., Ltd.** (1,147C).—Capital, £996,400 in £12 shares. Return dated March 11th, 1926. All shares taken up. £448,200 paid on 37,350. £448,200 considered as paid on 37,350. Mortgages and charges, nil.

**Leamington and Warwick Electrical Co., Ltd.** (13,780).—Capital, £100,000 in 2,500 preference and 7,500 ordinary shares of £10 each. Return dated February 26th, 1926. 1,100 preference and 6,800 ordinary shares taken up. £79,000 paid. Mortgages and charges, £35,000.

# City Notes.

### Reports and Meetings of Electrical Companies, Dividend Results, &c.

**Callender's Cable and Construction Co., Ltd.**

The report for the year ended December 31st last shows a balance to the credit of profit and loss of £368,644. After providing for debenture interest, preference dividends, depreciation and income tax, there remains a balance of £233,643, to which is added £462,695 brought forward, making £696,338. A dividend of 2s. per share is to be paid on the ordinary shares, making in the case of the old ordinary shares 3s., or 15 per cent., for the year, and £611,338 is to be carried forward. The company's business continued to expand and excellent results were obtained in its various departments. Keen competition was experienced and the profits on individual transactions were small. The substantial credit balance was due to economies in production, to the use of modern machinery, and to the great extent of the company's operations. The report says that there is every probability that large quantities of underground cable will be required in the near future, not only in Great Britain but also in countries in which a strong position has been secured; arrangements already made will enable the company to participate to the fullest extent in any such new business. The use of e.h.p. mains continues on an increasing scale, and the heavy expenditure incurred in providing plant and appliances for manufacturing these cables has been fully justified. The business in rubber wires and cables, which is a speciality of the Anchor Company, has made excellent progress during the year. Important contracts have been secured from abroad. A large order was placed for the Shanghai Tramways and the installation of the cables was carried out successfully by the company's engineers in spite of the disturbed state of the city. Notwithstanding the serious internal troubles in China, the company's business there still continues. The Okonite-Callender Cable Co., established in the United States, is now in successful operation and has secured many contracts for cables of the same type as those manufactured in England. The directors anticipate continued extension of this business in the United States. The directors of the company are of the opinion that the nominal capital should correspond more closely with the actual capital employed in the business. They therefore propose to increase the ordinary capital to £1,000,000 by the creation of 300,000 new shares. It is intended that 200,000 fully-paid ordinary shares should be distributed as a bonus from the reserves, each existing holder receiving one

new share for each three held. This will absorb the 100,000 shares already authorised but not yet issued and 100,000 of the new shares. There will then remain 200,000 shares to be issued as may be necessary in future. After this capitalisation the balance remaining to the credit of the reserve account will be £70,978. It is proposed to raise this to £400,000 by an allocation from the unappropriated balance at December 31st last, reducing the balance to be carried forward to £282,317. The necessary resolutions for these capital arrangements will be submitted at the annual meeting on June 3rd.

**Siemens Bros. and Co., Ltd.**

The report for 1925 records further improvement in all departments of the company's business and a substantially larger profit. The value of the unfulfilled orders at the close of the year was also greater. Steady progress was made during the year with the extensions of the Woolwich buildings and plant, and these are being brought into use as completed. The company has not yet reached a settlement with the Inland Revenue authorities in respect of its liability to excess profits duty. The profit for the year was £356,881, an increase of £90,583. After providing for debenture interest, &c., preference and interim ordinary dividends and income tax, there remains £176,112, from which is deducted a final dividend of 5 per cent. on the ordinary shares, making 7½ per cent. for the year (as in 1924), leaving £101,113. To this is added £195,027 brought forward, making £296,140, which it is proposed to carry forward. The report mentions the death of Mr. Francis Hird and the appointment of Dr. H. R. Wright as managing director; it also records the resignation of Mr. G. Chauvin and the appointment of Sir John Mann, K.B.E., to the vacancy on the board. The meeting is to be held on May 31st.

**Shanghai Electric Construction Co., Ltd.**

The profit for the year ended December 31st last was £72,159. To this is added £26,263 brought forward, less £20,000 transferred to renewals account, making £78,422. A further £20,000 is appropriated for renewals, £703 is transferred to reserve, £1,000 is provided for taxation, and £1,550 is contributed to staff provident fund, leaving £55,169. Interim dividends absorbed £30,000, and it is proposed to pay a final dividend of 4 per cent. (making 10 per cent. for the year), leaving £5,169 to be carried forward. The operating profit fell from £109,119 to £71,893, due to the disturbances in Shanghai, during which it was only possible to maintain a skeleton service. The trouble also delayed the putting into service of the new trolley omnibuses. Thirty-seven of these are now in operation, and the number is being gradually increased. The depreciation of the subsidiary coinage necessitated three fare increases during the year. For the current year the receipts compare very favourably with those for the first part of last year, and profits have been more than maintained. The special allocations for renewals have been necessitated by the heavy expenditure upon the general renewal of the permanent way, which is approaching completion. The newly-formed Singapore Traction Co., Ltd., is progressing with its conversion of the tramways to railless traction, and it is hoped to institute a service next month. The tramway earnings show a satisfactory tendency, but the lighting revenue, as was expected, has diminished. Meeting, June 2nd.

**Anglo-Portuguese Telephone Co., Ltd.**

The gross profit for the past year was £38,907. After providing for debenture interest, &c., and adding £5,804 brought forward, there remained £27,591. In view of the large sums required for development, the directors recommended that that amount should be carried forward, and they did not propose to pay a dividend.

The annual meeting of the company was held on May 17th. Viscount St. Davids, who presided, stated that although the company was not yet in the position which they hoped to attain, the situation was much better than it was a few years ago. They had earned a profit of £21,700 for the past year, but it was considered advisable to put the whole amount into the company's ordinary business rather than pay a dividend. Their telephone business was improving, and it was necessary to go forward or go under. They had been unable to raise new capital, but they hoped to improve the credit of the company to make that possible at no very distant date. The company's relations with the Portuguese Government remained good. The capital expenditure during the year amounted to £79,300, and they had opened new exchanges in Lisbon and Oporto; much, however, remained to be done, and unless new capital could be raised expenditure would have to be met out of revenue. The prospect for the current year was good, and the profit should, at least, be maintained.

**Pernambuco Tramways and Power Co., Ltd.**

The annual meeting was held on May 7th. Mr. W. Higgins, O.B.E., who presided, said that the expansion of the company's business continued. That was particularly marked in the tramway section in which traffic had compelled the company to undertake a comprehensive scheme of car building and conversion. The progress of Pernambuco also continued and among the recently-inaugurated improvements was the Boa Vigem line which the company was operating, sharing the profits with the State Government until the latter had recouped the cost incurred by it. It was hoped that the district served by this line would develop to important dimensions in the course of a few years. With regard to the lighting and power business, peak loads had risen to a point which demanded additional plant and the board had accordingly decided to order a new 6,000-kW set and the necessary accessories. The new unit would take the place of one of the old 1,000-kW sets and the plant would then have a capacity of 14,000 kW. The gas department also showed improvement and the business of the Telephone Co. of Pernambuco, Ltd., in which the company was interested held out good prospects. A new 50-year concession had been obtained and it was hoped to have the new automatic system in operation next year.

**Swedish Ericsson Co.**

The directors of the Allmänna Telefon Aktiebolaget L.M. Ericsson, report that the stock of orders almost doubled last year. At the beginning of 1925 they amounted to 6,550,000 kr. at the telephone factories and 1,040,000 kr. at the cable factory, and at the close of the year they were 14,010,000 kr. and 900,000 kr. respectively. The value of the deliveries from both departments reached 15,720,000 kr., as compared with 13,140,000 kr. in 1924. Out of this total the exports increased from 8,920,000 kr. in 1924 to 9,400,000 kr. last year, but the percentage to the total declined from 83.7 to 76.8 per cent. As the arrival of orders in 1926 has further expanded and represented a stock of 23,968,000 kr. on April 1st, the whole capacity of the works has been brought into use. Moreover, the company's subsidiary companies abroad have specialised in certain manufactures so as to complement the deliveries from Stockholm to foreign customers. The great development of the company and the possibilities of expansion abroad, the directors say, render it necessary to have recourse to the international money market to a greater extent than hitherto for the provision of capital, but a fundamental condition for this is that the balance sheet should be prepared in accordance with the principles practised abroad. In order to achieve this object it is considered that a further consolidation should take place and the directors therefore recommend that out of the profits of 2,042,000 kr., for 1925, the sum of 1,951,000 kr. should be devoted to this purpose and the balance carried forward. The net profits earned in 1924 amounted to 2,037,000 kr. The report further states that the activity of the foreign subsidiary companies proceeded on about the same level as in 1924, the economic results in general having been satisfactory.

**Lancashire Electric Light and Power Co., Ltd.**

Mr. G. Balfour, M.P. (chairman) presided at the annual meeting on May 14th, and in the course of his speech said that the business of the Lancashire Power Co. could be considered satisfactory. The Radcliffe station had been brought up to date, and the work at the Padiham station had proceeded, and it was hoped to commence supplying from the station in August this year. The cost per kWh delivered to the mains had been reduced from 0.275d. to 0.25d., while the total cost per kWh sold fell from 0.489d. to 0.483d. During the year considerable additions were made to the transmission and distribution systems. Notwithstanding the adverse trade conditions there had been a general expansion in business—except with regard to collieries. Further considerable capital expenditure was in prospect. Referring, in conclusion, to the Electricity (Supply) Bill, Mr. Balfour said that as it stood it was a thoroughly bad measure, and it could only be made to serve the interests of the public by drastic amendment.

**Shropshire, Worcestershire and Staffordshire Electric Power Co.**

Speaking at the annual meeting, which was held on May 18th, Mr. E. Garcke (chairman) said that distinct progress had been made, resulting in an increase of £38,000 in the profit. A further 15,000-kW set was being installed at the Stourport station, and the Treasury had agreed to provide a further £70,000 on similar terms to the original loan, but with a reduction in interest charges. After a long delay the Stourport station was now in a position to generate energy. The improvement had continued during the first part of the current year, but it had been somewhat retarded by the general strike. In this connection, Mr. Garcke said that not one of the employés had left the company during the emergency. Business was not growing very rapidly in the rural areas, but it was quite satisfactory, and the company had been successful in introducing electricity into many backward districts. Some of those areas were as much as 30 miles from the industrial centre of supply.

**Lanarkshire Tramways Co.**

The annual meeting was held on April 30th, Mr. A. R. Monks (chairman) presiding. In the course of his speech the chairman said that it was a matter of regret to the board that after presenting for 22 years annual accounts which had disclosed, after making adequate reserves, profits which had enabled the company to pay dividends averaging 6¼ per cent., they now had to submit accounts showing a heavy loss. Motor omnibus competition had shown a continuous increase. They had interviewed the Ministry of Transport and they understood that a Bill would shortly be promoted in Parliament which would enable local authorities to regulate and control motor services; until such steps were taken they proposed to restrict their activities and by exercising all practicable economies they hoped to ameliorate the position. They had recently negotiated a further loan to enable them to carry on until they were in a position to make a capital issue on satisfactory terms.

**Calcutta Electric Supply Corporation, Ltd.** In presenting the report and accounts (*vide* our last issue, p. 774) at the annual meeting on May 19th, the chairman, Lord Meston, said that the first mortgage debenture loan had been reduced by £430,000 owing to its conversion into ordinary shares. The value of fixed assets had risen by £320,000, due partly to the commencement of the construction of the new power station at the Calcutta Docks. The balance of the necessary funds for that station had been successfully raised by a share issue in the early part of the current year. A part of the proceeds of that issue was to be devoted to the reduction of the outstanding first debentures. The company's output in 1925 had risen by about 15 million kWh in spite of bad trade in Calcutta. The costs had remained practically stationary owing to the lower price of coal. The company's charges for electricity for industrial purposes had been reduced and it was anticipated that the rates for domestic supply would be lowered when the new station was in operation.

**French Companies.** The report of the *Compagnie des Forges et Ateliers de Constructions Electriques*, Jeumont, for 1925, shows a net profit of 8,834,000 fr., as compared with 5,993,000 fr. in 1924. It is proposed to pay a dividend at the rate 20 fr. per share as against 15 fr.

The *Société Gramme* reports net profits of 590,000 fr. for 1925 as compared with 568,000 fr. in the previous year; the rate of dividend is maintained at 60 fr. per share.

The *Compagnie du Chemin de Fer Metropolitain*, Paris, reports net profits and interest receipts amounting to 15,214,000 fr. for 1925, permitting of the payment of a dividend of 35 fr. gross per ordinary share.

The *Compagnie Electro-Mécanique* reports a net surplus of 1,530,000 fr., of which the sum of 1,210,000 fr. has been written off for depreciation and the balance carried forward.

The *Société des Magnetos R.B.* proposes to pay a dividend at the rate of 26 fr. per share for 1925, as compared with 42.30 fr. in the preceding year, on a larger share capital.

The *Société Parisienne pour l'Industrie des Chemins de Fer et des Tramways Electriques* records an increase in the net profits from 4,803,000 fr. to 5,168,000 fr., the dividend remaining at 16 fr. per share.

The *Compagnie Radio-Maritime* reports net profits of 2,093,000 fr. for 1925. A dividend of 22 fr. per share is again being paid.

*The Société des Produits Chimiques et Electro-Métallurgiques Alais, Froges et Camargue* (Pechiney), reports net profits of 24,853,000 fr., as against 17,473,000 fr. The dividend is raised from 8 to 10 per cent.

The *Société Indo-Chinoise d'Electricité*, of Paris, is increasing its capital from 11,900,000 fr. to 20 million fr.

**German Companies.** The *Mix and Genest Telephone and Telegraph Works Company*, Berlin, states that business in automatic telephone stations materially increased in 1925. Besides a number of private installations, exchanges for 17 towns were in hand and two already set in operation. On the other hand the Post Office orders for apparatus declined. The net profit was 605,000 marks, and the dividend is at the rate of 8 per cent.

The *Kortings Electricity Works Company*, Berlin, reports net profits of 187,000 marks in 1925, and proposes to pay a dividend of 8 per cent.

The *Voigt and Haeffner Company*, Frankfort-on-Main, again recommends a dividend at the rate of 8 per cent.

The *Duisburg Cable Works Company* is paying a dividend of 8 per cent. out of net profits of 653,000 marks, as compared with 6 per cent. in 1924.

The *Continental Company for Electrical Undertakings*, Nuremberg, records net profits of 488,000 marks for 1925, permitting of the payment of certain arrears on the preference capital and a dividend of 4 per cent. on the ordinary shares.

The report of the *Hartmann and Braun Company*, Frankfort-on-Main, states that the value of the turnover in 1925 increased, but satisfactory profits were not realised owing to higher production costs. The accounts show a net profit of 122,000 marks and the dividend on the ordinary shares remains at 5 per cent.

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**Chinese Company.**—The *Société des Tramways et Eclairage Electrique de Shanghai* reports a profit of 22,540,151 fr. for the last financial year, as compared with 17,720,235 fr. in 1924. It is proposed to increase the capital of the concern from 30 to 40 million fr.

**Marconi's Wireless Telegraph Co., Ltd.**—The terms of the agreement with the Postmaster-General for a licence for the conduct of telegraph services between Great Britain and foreign countries provide that the company shall continue under British control, and in order that the articles of association can be altered to meet this requirement extraordinary general meetings are to be held on May 31st. Not more than 25 per cent. of the issued share capital of the company may at any one time be in foreign hands, and under the agreement the words "United Kingdom or India or any British Dominion, Colony or Dependency" cover the Irish Free State. It will be necessary in future for special forms of transfer to be used in order that a proper allocation of shareholdings can be made.

**Cuba Submarine Telegraph Co., Ltd.**—The report for 1925 records receipts of £63,404 and expenses amounting to £25,970. After providing for taxation and cable repairs there remains £25,350, to which are added £6,196 brought forward and £1,140 difference in exchange, making £32,686. The directors, after charging interim dividends and placing £10,795 to general reserve, recommend final dividends at the rate of 10 per cent. on the preference shares and at the rate of 5 per cent., free of tax, on the ordinary shares, leaving £7,892 to be carried forward. In spite of new competition the traffic derived from the West India and Panama Company's system was well maintained. Meeting: To-day (Friday).

**Birmingham District Power and Traction Co., Ltd.**—The annual meeting was held on May 19th under the chairmanship of Mr. C. Shirreff Hilton, who said that the accounts showed that the position of the company had again been strengthened. The dividend, the amount carried to reserve, and the balance brought forward had all increased. The difficulties engendered by motor-omnibus competition continued, and their subsidiary companies had had to adopt the policy of abandoning unremunerative tramway lines. The Birmingham and Midland Motor Omnibus Co., Ltd., continued to provide efficient services in an area of 2,000 sq. miles, and the Shropshire, Worcestershire and Staffordshire Electric Power Co. had again increased its ordinary dividend.

**Great Northern Telegraph Co., Ltd., of Denmark.**—The directors' report for 1925 shows that the net revenue decreased from £367,704 to £253,267. The addition of the balance brought forward makes £566,938 available for distribution. The total distribution for the year is 20 per cent., as compared with 22 per cent. in 1924. The reserve and renewal fund receives £19,444, bringing it up to £3,656,759, and £244,438 is carried forward. The lower revenue is attributed to the general commercial depression in Europe as well as to competition; Government-owned radio stations are particularly mentioned in the latter aspect.

**Scottish General Transport Co., Ltd.**—The revenue for 1925 was £28,718. From this are deducted administrative expenses, and allocation to renewals, and £11,302 is added from the previous accounts, leaving a disposable balance of £11,345, which the directors recommend should be carried forward. A dividend of 5 per cent. was paid for 1924. The report states that the lower profit is due to the failure of the Greenock and Port Glasgow Tramways Co. to pay a dividend. The capital expenditure during the year was £81,315, largely in connection with the company's omnibus services.

**Aron Electricity Meter, Ltd.**—The net profit for the year ended March 31st last, after providing for depreciation, taxation, &c., was £11,424 and the balance available, adding the amount brought forward, £14,548. As we have already reported, a dividend of 6 per cent. is to be paid on the ordinary shares. £3,000 is transferred to reserve and £2,942 carried forward. The meeting was to be held yesterday (Thursday).

**West Kootenay Power and Light Co.**—The profit for the past year amounted to $135,219, and to this is added $11,374 brought forward. $95,854 is transferred to sinking fund, the preferred dividends absorbed $35,000, and $16,609 is carried forward.

**Submarine Cables Trust.**—The report for the year ended April 15th last records a revenue of £30,264 and a balance (including £11 brought forward) of £28,529. The payment of coupons absorbs £3,258, £25,198 is transferred to the redemption fund, and £81 is carried forward.

**Adelaide Electric Supply Co., Ltd.**—The directors have authorised the payment of the dividend on the 8 per cent. preferred ordinary shares for the past half-year and an interim dividend of 6 per cent., free of tax, on the ordinary shares.

**American Telephone and Telegraph Co.**—Last week an issue was made of $154,000,000 of capital stock, bringing the company's capital up to $1,073,000,000, the highest ever reached by an American company.

**Dorman, Long & Co., Ltd.**—The directors have declared the interim dividend on the 6 per cent. cumulative preference shares, but do not propose to make any interim distribution on the 8 per cent. preferred ordinary or ordinary shares.

**Commonwealth Edison Co.**—The company reports a gross income for the past year of $16,805,144, and a net income of $10,766,786. Dividends absorb $7,202,942 and a balance of $3,563,844 is carried to surplus account.

**Brush Electrical Engineering Co., Ltd.**—The directors state that the issue of the report and accounts has been delayed. They recommended the payment of a dividend of 10 per cent. for the past year, as in 1924.

**Stock Exchange Notice.**—Dealings in the following have been specially allowed by the Committee under Rule 159:—

American Telephone and Telegraph Co.—18,805 shares of $100 each.

**British Columbia Electric Railway Co., Ltd.**—Dividends of 4½ per cent., free of tax, have been declared on both the preferred and deferred ordinary stocks.

**Northampton Electric Light and Power Co., Ltd.**—The directors state that the issue of 70,000 ordinary "B" shares to existing shareholders at 27s. each has been fully subscribed.

**West African Telegraph Co., Ltd.**—The directors have declared a dividend at the rate of 4 per cent. free of tax, on the ordinary shares.

**Dubilier Condenser Co. (1925), Ltd.**—The directors recommend a dividend of 5 per cent. on the ordinary shares.

# Stocks and Shares.

TUESDAY EVENING.

STOCK EXCHANGE markets recovered easily, in accordance with their reputation for elasticity, from the effects of the general strike. The deadlock in the coal trade exercised but a slight influence over prices except those in the coal, iron and steel group. In the latter, the continuance of the miners' deadlock is held likely to hasten the day when some of the iron and steel concerns will have to take in hand the reorganisation of their finances. Several of the companies are in a sound and a secure position, but others must reconstruct before they can hope to return to financial stability. The coal dispute has no effect upon electricity supply shares, several of whose prices stand higher on the week.

Home Railway stocks are, of course, moving very cautiously. Even in these, however, the tone is fairly firm, all things considered. Undergrounds are better. The lovely weather at Whitsun combined with restricted steam railway services to keep holiday-makers within a narrow radius from their homes, and drove people to 'buses and tubes as a means of escape into the fresh air. Therefore, on returning to business after the holiday, the Stock Exchange sang, with Empire Day fervour, the National Anthem and then proceeded to put up the prices of the various Underground issues.

British Columbia Electric Railway deferred and preferred are several points higher on the increased interim dividends of 4½ per cent. declared on both stocks. That the advances of 10s. per cent. had been anticipated, the readers of these notes will need no reminder. British Electric Traction is up 5, on the recent increase of 1 per cent., to 7 per cent., in the dividend. No changes have occurred in the London traction descriptions.

Brazilian Tractions rest within a couple of points of par; the level 100 is likely to be reached before long, if only by reason of the incessant demand for the shares on account of Canadian buyers. Mexican stocks are irregular.

The Shanghai Electric Construction Company has halved its previous dividend of 20 per cent. Profits at £72,100 were down by £32,500 owing to the disturbances, which began a year ago, at Shanghai. Normal traffic conditions were restored at the end of the year. The report states that the traffic returns in the current year are the largest hitherto recorded.

Cable and electrical construction shares are a very lively market. Siemens have been fluctuating sharply. The eagerly-awaited dividend is 5 per cent., making 7½ per cent. for the year, and showing no change. The directors speak well of the progress made in the company's business, with the exception of the foreign branch, which, they say, is not yet satisfactory. Questions relating to E.P.D. are still unsettled with the Inland Revenue; agreement is expected very shortly. The price of the shares touched 32s., to revert to 30s. 6d. upon slight disappointment with the dividend.

Callender's are a good market at 4. The profits shown by the report are £12,000 up at £289,644; the dividend goes on as before at 15 per cent., and £200,000 is to be capitalised from the reserve fund for distribution as a bonus amongst the shareholders. Henley's are 3¼, anticipation going for a "banner" report. Most of the other members of this group are better on the week. Rises have taken place in British Aluminium, British Insulated, Edison 5 per cent. debenture, Brush, Electric Constructions, General Electrics, Enfield ordinary, and Johnson & Phillips. A further jump in Babcocks lifted the price 3s. to 52s. Considerable business is being done in this department.

Electricity Supply shares are steady, County ordinary providing the main feature, with a rise to 59s. Charing Cross ordinary gained 1/16 at 45s. 9d. The other fluctuations are smaller. Dealers in this market are large buyers of the best-class debenture stocks. London Power 5 per cent. debenture has strengthened to 97, which is 1 premium above the issue price. A full six months' interest becomes payable in October.

In spite of the ever-growing inquiry for good industrials—capital must seek employment in Stock Exchange securities if trade is too stagnant to absorb it—cable issues are somewhat neglected. Prices in the Eastern quartette remain steady, but are practically unchanged, nor have they moved to any quotable extent during the excitements of this month. The Cuba Submarine Telegraph has declared its regular dividend of 5 per cent. tax free, and the shares are about 6¾ middle. Great Northerns weakened on the reduction of 2 per cent., to 20 per cent., in the dividend, and Indo-Europeans are ex 37s. 6d. dividend, at 45½. An extraordinary meeting of the Marconi's Wireless Telegraph Company will be held next Monday in order to alter the articles of association. Negotiations with the Postmaster-General for a licence for the conduct of telegraph service between Great Britain and foreign countries have been brought to a satisfactory conclusion. Not more than 25 per cent. of the company's capital may be held in foreign hands, and special forms of transfer-deeds will be required to ensure this end. The Egyptian Government has granted the company a thirty-year concession.

# Share List of Electrical Companies.

| | Nom. £ | Dividend. 1924 | Dividend. 1925. | Price May 25 1925. | Rise or fall. | Yield, p.c. |
|---|---|---|---|---|---|---|
| **HOME ELECTRICITY COMPANIES.** | | | | | | |
| Bournemouth and Poole ... ... | 1 | 14 | 14 | 55/9 | — | 4 16 0 |
| Brompton Ordinary ... ... ... | 1 | 10 | 10 | 31/9 | −9d. | *6 6 1 |
| Charing Cross Ordinary ... ... | 1 | 15 | 15 | 45/9 | +1/16 | 6 10 10 |
| do. do. 4½ Pref. ... | 1 | 4½ | 4½ | 17/- | — | 5 5 11 |
| Chelsea ... ... ... ... ... | 1 | 12 | 12 | 2 | — | 6 0 0 |
| City of London ... ... ... | 1 | 15 | 15 | 45/9 | — | 6 11 2 |
| do. do. 6% Pref. ... ... | 1 | 6 | 6 | 22/- | −6d. | 5 9 1 |
| Clyde Valley ... ... ... ... | 1 | 8 | 8 | 27/- | — | 5 18 6 |
| County of London ... ... ... | 1 | 15 | | 59/6 | +3/6 | 5 0 10 |
| do. do. 6 % Pref.... ... | 1 | 6 | 6 | 22/6 | +6d. | 5 6 8 |
| Edmundson's Ordinary ... ... | 1 | 7 | 7 | 23/- | −6d. | 6 1 9 |
| do. 7% Pref. ... ... | 1 | | 7 | 22/6 | +6d. | 6 4 8 |
| Elec. Supply Corporation ... ... | 1 | 10 | 10 | 32/6 | — | 6 3 0 |
| Kensington Ordinary ... ... | 5 | 15 | 15 | 13½ | — | 5 11 1 |
| Lancs. Light and Power ... ... | 1 | 7½ | 7½ | 24/6xd | — | 6 3 5 |
| London Electric ... ... ... | 1 | 10 | 10 | 32/6 | +6d. | 6 3 1 |
| do. do. 6% Pref. ... ... | 5 | 6 | 6 | 5¾ | — | 5 11 7 |
| Metropolitan ... ... ... ... | 1 | 11 | 11 | 35/9 | — | 6 2 10 |
| do. 4½% Pref. ... ... | 1 | 4½ | 4½ | 17/- | — | 5 5 11 |
| Midland Counties ... ... ... | 1 | 5½ | 6 | 20/- | — | 6 0 0 |
| Newcastle-on-Tyne Ordinary ... | 1 | 7 | 7 | 22/- | +9d. | 6 7 3 |
| do. 5% Pref. ... | 1 | 5 | 5 | 18/- | — | 5 11 1 |
| do. 7% Pref. ... | 1 | 7 | 7 | 24/- | — | 5 16 8 |
| Notting Hill 6% Pref. ... ... | 10 | 6 | 6 | 9½ | — | 6 6 4 |
| North Met. Elec. 6% Pref.... ... | 1 | 6 | 6 | 22/6 | — | 5 6 8 |
| St. James' and Pall Mall ... ... | 5 | 17½ | 17½ | 16½ | — | 5 8 6 |
| South London... ... ... ... | 1 | 15 | 15 | 2¾ | — | 6 6 4 |
| South Metropolitan Pref. ... ... | 1 | 7 | 7 | 25/6 | — | 5 9 10 |
| Urban Ordinary ... ... ... | 1 | 4 | 7 | 1 1/16 | — | 6 11 9 |
| do. 6% Pref. ... ... | 1 | 6 | 6 | 1 | — | 6 0 0 |
| Westminster Ordinary ... ... | 1 | 15 | 15 | 43/3 | — | 6 18 9 |
| Whitehall Elec. Invst. 7½% Pref.... | 1 | 7½ | 7½ | 19/6 | — | 7 13 10 |
| Yorkshire Elec. ... ... ... | 1 | 8 | 8 | 27/- | +6d. | 5 18 6 |
| **HOME RAILS.** | | | | | | |
| Central London Ord. Assented ... | Stock | 4 | 4 | 68 | — | 5 17 |
| Metropolitan ... ... ... ... | ,, | 5 | 5 | 65½ | +1 | 7 12 |
| do. District ... ... | ,, | 8½ | 8½ | 83 | +1½ | 6 12 |
| Underground Electric Ordinary ... | 10 | Nil | Nil | 8¾ | +¾ | Nil |
| do. do. "A" ... | 1/- | Nil | Nil | 11/6 | +1/6 | Nil |
| do. do. Income ... | Bonds | 6 | 6 | 99 | — | *6 1 |
| **TELEGRAPHS AND TELEPHONES.** | | | | | | |
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 101½ | +½ | 5 18 3 |
| do. Def. ... ... | ,, | 1½ | 1½ | 23¾ | — | 6 6 4 |
| Automatic Telephone ... ... | 1 | 3 | 6 | 2½ | +1/16 | 4 0 0 |
| Chili Telephone ... ... ... | 5 | 6 | 5 | 6¾ | — | *3 12 9 |
| Cuba Sub. Ord. ... ... ... | 10 | 5 | 5 | 6¾ | — | 7 8 3 |
| Eastern Extension ... ... ... | 10 | 10 | 10 | 17½ | — | *5 12 8 |
| Eastern Tel. Ord. ... ... ... | Stock | 10 | 10 | 175½ | — | *5 14 0 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 17½ | — | *5 12 8 |
| do. do. Pref. ... ... | 10 | 6 | 6 | 10½ | — | 5 11 7 |
| Great Northern Tel.... ... ... | 10 | 22 | 20 | 28 | −1 | 7 2 10 |
| Indo-European ... ... ... | 25 | 8½ | 10 | 45¼ | — | *5 10 0 |
| Marconi... ... ... ... ... | 1 | 10 | 10 | 1 1/16 | — | 8 8 6 |
| Marconi Marine ... ... ... | 1 | 10 | 7½ | 18/9 | — | 8 0 0 |
| Oriental Telephone Ord. ... ... | 1 | 12 | 12 | 42/6 | +6d. | *5 18 3 |
| United R. Plate Tel.... ... ... | 5 | 8 | 8 | 7½ | −1/16 | *5 2 7 |
| Western Telegraph ... ... ... | 10 | 10 | 10 | 17½ | — | *5 15 11 |
| **HOME AND FOREIGN TRAMS, &c.** | | | | | | |
| Anglo-Arg. Trams First Pref. ... | 5 | 5½ | 5½ | 8¾ | +1/16 | 8 16 0 |
| do. do. 2nd Pref. ... | 5 | 6 | 6 | 2 1/16 | — | 11 3 4 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 71½xd | — | 6 19 10 |
| British Electric Traction Ord. ... | ,, | 6 | 7 | 132½ | +5 | 5 5 8 |
| do. do. 6% Pref. ... | ,, | 6 | 6 | 110 | +3 | 5 12 2 |
| Brazil Traction ... ... ... | 100 | 4 | 5 | 93 | — | 5 7 6 |
| Brit. Columbia Elec. Rly. Pcc. ... | Stock | 5 | 5 | 86½ | +1 | 5 17 0 |
| do. do. Preferred ... | ,, | 9/- | 12/6 | 100½ | +4 | *5 16 0 |
| do. do. Deferred ... | ,, | 129/6 | 8 | 132 | +6 | *6 1 3 |
| do. do. Deb. ... | ,, | 4½ | 4½ | 75 | — | 5 13 4 |
| London & Sub. Trac. 5% Pref. ... | 1 | 2½ | Nil | 6/- | — | Nil |
| London United Tram. Deb. ... | Stock | 4 | 4 | 49 | +1 | 8 3 4 |
| Mexico Trams, 5% Bonds ... ... | — | 5 | 5 | 65½ | +2 | 7 12 6 |
| Mexican Light Common ... ... | 100 | Nil | Nil | 32½ | +2 | Nil |
| do. Pref. ... ... | 100 | Nil | Nil | 78½ | −2 | Nil |
| do. 1st Bonds ... ... | — | 5 | 5 | 70½ | — | 7 1 10 |
| Yorkshire (West Riding) ... ... | 1 | 5 | — | 14/- | — | 7 2 10 |
| **MANUFACTURING COMPANIES.** | | | | | | |
| Babcock & Wilcox ... ... ... | 1 | 12 | 13 | 52/- | +3/- | *5 0 0 |
| British Aluminium Ord. ... ... | 1 | 5 | 10 | 2½ | +1/16 | 5 0 0 |
| British Elec. Transformer Pref. ... | 1 | Nil | 7 | 18/9 | — | 7 9 4 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 3 3/16 | +1/16 | 4 14 1 |
| Brush Ord. ... ... ... ... | 1 | 10 | 10 | 27/- | +1/9 | 7 5 6 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 4 | +½ | 3 15 0 |
| do. 6½% Pref.... ... ... | 1 | 6½ | 6½ | 2 1/9 | — | 5 9 5 |
| Crompton Ord. ... ... ... | 1 | Nil | Nil | 15/- | — | ... ... |
| Edison-Swan ... ... ... ... | 4/- | 10 | 10 | 8/3 | — | 4 17 0 |
| do. 5% Deb. ... ... | Stock | 5 | 5 | 83 | +½ | 6 0 6 |
| Electric Construction ... ... | 1 | 10 | 10 | 32/6 | +1/6 | 6 3 0 |
| Enfield Cable, Pref. ... ... | 1 | 7½ | 7½ | 1½ | — | 6 0 0 |
| English Electric ... ... ... | 1 | 5 | Nil | 16/3 | — | ... ... |
| do. do. Pref. ... ... | 1 | 6 | 6 | 19/- | +9d. | 6 6 4 |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 23/- | — | 5 13 1 |
| ,, Ord. ... ... ... | 1 | 5 | 7½ | 29/9 | +9d. | 5 0 10 |
| Henley ... ... ... ... | 1 | 15 | 16 | 3¼ | +¼ | 4 2 9 |
| do. 4½% Pref. ... ... ... | 5 | 4½ | 4½ | 4½ | — | 5 6 0 |
| India-Rubber... ... ... ... | 1 | 5 | 5 | 22/6 | — | *4 8 11 |
| Johnson & Phillips ... ... ... | 1 | 10 | 17½ | 3 | +1/16 | 5 16 9 |
| Met.-Vickers Ord. ... ... ... | 1 | 8 | 8 | 25/- | +2/- | 6 8 0 |
| do. Pref. ... ... ... | 2 | 8 | 8 | 2¾ | — | 6 14 9 |
| Siemens Ord. ... ... ... ... | 1 | 7½ | 7½ | 30/6 | — | 4 18 4 |
| Telegraph Construction ... ... | 12 | 20 | 10 | 27½ | — | *4 7 8 |

*Dividends paid free of Income Tax.

# The Ruths Steam Accumulator.

## An Interesting Development with Important Possibilities.

By ALFRED J. T. TAYLOR.

(*Abstract of Paper read before the* INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.)

AT the Wembley World Power Conference, Dr. Johannes Ruths presented a paper on his steam accumulator, the importance of which was referred to in six other World Power Conference papers by European engineers. The system designed by Dr. Ruths had, up to that time, been the subject of over 200 technical articles in foreign languages, and been applied beneficially in 17 distinct lines of manufacture. The accumulator had been definitely out of the experimental stage for over four years, yet in July, 1924, there was only one Ruths accumulator in the British Empire and only two others in the rest of the English-speaking world. Not a single technical paper in the English language had dealt comprehensively with Dr. Ruths' inventions, which I believe to be the most far-reaching in the field of industrial steam engineering during the past 15 years.

English-speaking engineers, familiar with the limitations of prior developments of steam storage, have felt until recently that the work being done in Scandinavia and on the Continent along these lines was but a variant of work previously done here, and, therefore, suffered from similar limitations. It is partly as a result of this attitude that the entire English-speaking world has been about three years late in grasping the significance of the Ruths system, which has already been applied in more than 200 industrial plants.

The effect that variations in the consumption of steam, or power, exercise on the working methods and overall efficiency of our industrial plants, often much greater than is generally known, has been accepted as unavoidable; and attempts have been made to counteract their effects by providing greater flexibility in the firing apparatus.

All firing equipment has a certain time lag in responding to changes in load conditions, and during this period the operating efficiency falls off. There is one definite point in the output of steam for each boiler when the overall efficiency of the unit is at the maximum.

The Ruths accumulator is based on the principle of storing in a large quantity of water under pressure and at saturation temperature the heat energy of steam, and releasing this energy in the form of steam under decreasing pressure. It will accommodate wide fluctuations in steam demand over periods of hours if necessary, and is, in fact, the flywheel of the boiler plant. For example, if a pressure of 400 lb. in a boiler is lowered to, say, 350 lb., 0.8 lb. of steam will be obtained from each cubic foot of water. The accumulator can be arranged to work at much lower pressures, say, between 60 and 10 lb.; for this pressure range the storage capacity is 4.2 lb. of steam per cubic foot of water. Thus, for the same pressure drop of 50 lb. the storage capacity of the accumulator may be five times larger than in the modern boiler for the same quantity of water. In addition, the boiler in this example has to be built to withstand 400 lb. pressure, but the accumulator only 60 lb. Steam storage capacity in an accumulator can, therefore, be obtained much more cheaply than in a boiler, which should be built only for the purpose of generating steam at a constant rate, and all superfluous water space should be arranged for in a separate receptacle, built for a lower pressure, in which much wider pressure fluctuations may be allowed than in the boiler. It is significant that Dr. Frederick Münzinger in his paper before the World Power Conference on "High-Pressure Boilers" writes:—"One can see, according to our present knowledge, that in many cases the economical use of high-pressure steam in stations with high peaks could probably only be made possible by the installation of such accumulators."

The accumulator is built in the form of a cylindrical steel tank with hemispherical ends. Its volume is so large in comparison with its exterior surface that insulation 3 to 4 inches in thickness is sufficient to reduce the heat loss to a negligible amount. It is usually installed in the open air and consists of two parts: the accumulator proper and the automatic valves which control the co-operation of the boilers and the accumulator, and also govern the steam distribution throughout the whole works (fig. 1). The tank A is filled about 90 per cent. full of water. Over this is a covering B of non-conducting material, with insulation blocks C covering the riveted seams of the shell, easily removable for the inspection of the seams; this lagging is protected by a light sheet-iron cover D. The non-return valve E admits charging steam to the internal steam-distribution pipe F and the charging nozzles G, which are equipped with circulation pipes H to ensure uniform and noiseless heating of the water. Through a non-return valve I the discharge of steam takes place; a de Laval nozzle K limits (in case of emergency, such as a rupture in the steam piping) the maximum discharge of steam from the accumulator to an amount which will not allow priming. A water column L and feed valves M are provided for reading and adjusting the water level in the accumulator.

Condensation of steam in the accumulator, due to radiation losses, tends to increase the average water level, but the fact that the accumulator is charged with steam of higher pressure and higher heat content and discharges steam at lower pressure, *i.e.*, that it is consequently discharging more steam than it is taking in, counterbalances the condensation so well that a readjustment of the water level is seldom required.

The capacity of an accumulator for a given plant is determined by the magnitude of the fluctuations of the steam consumption only, and not by the capacity of the boiler plant. Suppose the accumulator is connected between two pipe lines carrying pressures of 150 and 50 lb. per square inch respectively; one cubic foot of water can store 4.2 lb. of steam; therefore, if a storage capacity of 25,000 lb. of steam is desired, and 90 per cent. of the accumulator volume is occupied by water, the volume of the accumulator will be $25{,}000/4.2 \times 0.9 = 6{,}613$ cu. ft. Steam accumulators have been built in sizes of from 200 to 13,000 cu. ft. volume, and one mill installation has a total volume of 37,000 cu. ft. with a capacity of 150,000 lb. of steam; it is sub-divided into three separate tanks. The total volume of all Ruths accumulators now in operation, or under erection, is 960,000 cu. ft., with a total capacity of about 3,700,000 lb. of steam and a water weight of about 56 000,000 lb.

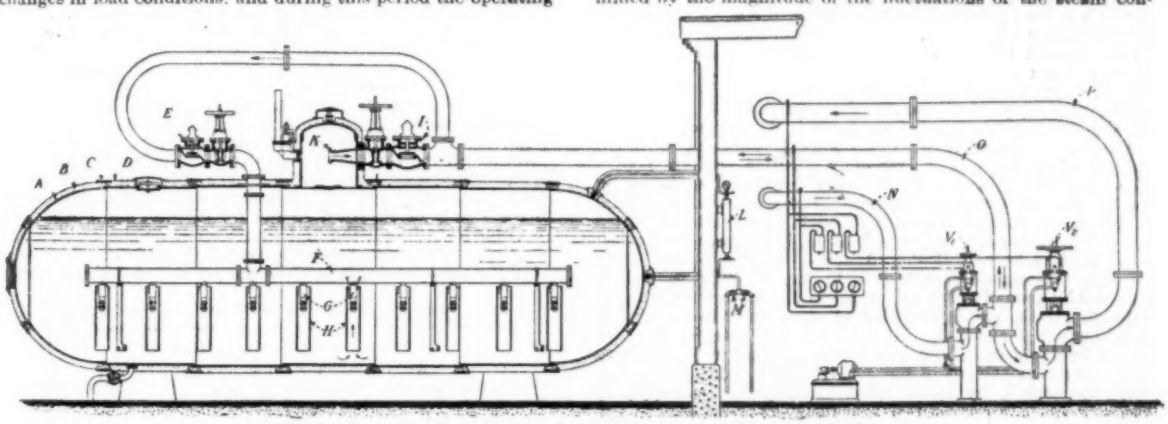


Fig. 1.—Ruths Steam Accumulator Installation; Steam Switchboard on Right.

Of the greatest importance for the proper functioning of the system is the regulating equipment (the steam switchboard). The accumulator must be connected between high- and low-pressure steam lines, and the pressure in the steam header is always kept constant; the accumulator pressure only is allowed to vary. Steam is generated in the boiler house at, for instance, 150 lb. per sq. in. pressure, and reduced by valve RV to 25 lb., fig. 2. Due to a fluctuating steam demand, the boiler pressure cannot be kept constant; Ruths' theory was to insert an overflow valve OV, which only passes enough steam to maintain a constant pressure in the boiler. In most cases, however, the steam supply through OV and the steam demand through RV are not always equal, and there is a difference in time between them; therefore, an accumulator has to be inserted between OV and RV capable of storing enough steam to maintain the balance. If the pressure in the accumulator drops to 25 lb. and there is still demand for

steam in excess of the supply from the boilers, the low pressure will drop below 25 lb. To prevent this, a reducing valve RV is connected in parallel with OV, to by-pass sufficient steam to maintain the low pressure regardless of the condition of OV. Often the accumulator is built for a lower pressure than that of the boiler (for instance, for 125 lb.), in which case a valve MV is required to protect the accumulator from being overcharged, and by using these four valves an absolute balance and constant pressure are maintained, except under extreme conditions beyond the range for which the particular plant has been designed.

In practice the arrangement has been improved by combining in a single valve all the functions of valves OV, RV, and MV. In fig. 1, valve $V_1$ is connected to the boiler main N, and is controlled by the boiler pressure in such a way as to maintain it constant; that is, the valve acts as an overflow for the boiler, being set for a pressure slightly lower than the safety valves. The popping of the safety valves on the boilers will always be prevented, and when steam is generated in excess of the pressure for which the valve is adjusted it will automatically pass through this valve into the accumulator

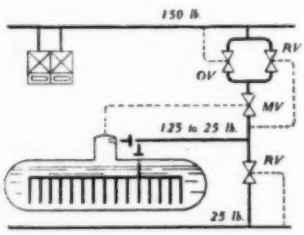


Fig. 2.—System of Automatic Valve Control.

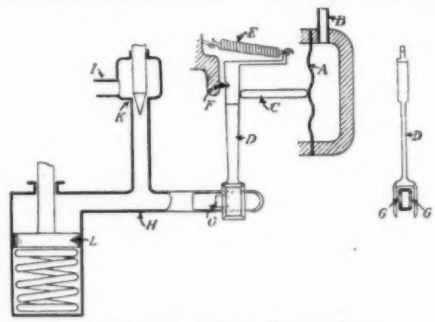


Fig. 3.—Principle of Steam Pressure Relay.

line O. A reducing valve $V_2$ maintains a constant pressure in line P leading to the steam consumers. According to whether at a given moment more or less steam is passed through valve $V_1$ than through valve $V_2$, the accumulator will be charged or discharged. If the accumulator should happen to be charged up to its maximum pressure, $V_1$ will shut off further steam supply to the accumulator; if the accumulator should happen to be completely discharged, $V_1$ will secure a sufficient supply of steam to the secondary steam line P, despite the fact that the accumulator is discharged.

Correct co-operation of the different functions of these control valves depends on extremely sensitive pressure regulation, and the principle of the relay developed is shown in fig. 3. The motion of the steel diaphragm A, which is exposed to the steam pressure admitted through pipe B, is transmitted by rod C to the lever D, which is held by spring E against edge F. The lower fork-shaped end of lever D covers, more or less, two opposite orifices G in the oil pipe H. Oil is supplied by a small motor-driven pump under constant pressure through pipe I, and is throttled at K. A small movement of A is magnified about 50 times by D; this changes the size of the two orifices G, and hence the pressure in H, resulting in a certain movement of the spring-loaded piston L which is used to control, by means of a pilot valve, the supply of pressure oil to a servo-motor actuating the regulating valve, which is equipped also with the return motion required for stability of regulation. These valves can be adjusted to regulate any steam pressure, and to keep it constant within a range of less than one pound. The time required for opening and closing may be regulated between one-fifth of a second and 60 seconds. Further, these valves may be closed instantaneously by relieving the oil pressure and then operating the hand wheel on the top of the valve. All moving parts work in a closed oil system, so that wear and need for attendance are practically negligible.

The most important advantage, and the one most difficult to appraise, is the beneficial effect of the system upon the quantity and quality of production. Just as constant voltage is an indispensable requirement in an electrical system, so constant steam-pressure and temperature are indispensable for uninterrupted production and uniform quality in the goods produced. The fact that boiler efficiency during actual operation never equals test results has been confirmed by an increased efficiency in plant equipped with accumulators; the boilers may operate continuously under the most favourable test conditions, and savings in fuel of from 10 to 30 per cent. have been made. Forcing the boilers will be avoided, brickwork and boiler will be kept at an even temperature and relieved of the constant expansion and contraction which acompany a fluctuating load, which will reduce the upkeep cost.

Since the operation of the accumulator installation is entirely automatic, and the operation of the boiler house and power plant is greatly simplified, a saving in labour operation costs will result. Both the capital and operating costs of a new steam-power plant will be considerably reduced, and if an accumulator is installed in an existing plant other savings will pay for the installation in a short time.

Typical installations may be mentioned to indicate some of the advantages of installing a steam accumulator: In the case of a textile mill, the shortening of the time necessary to heat the dyeing kettles resulted in an increased output of not less than 10 per cent.; also the quality of the product was improved, and it was possible to increase the output of the steam engines from 650 to 800 kW, which meant a reduction in purchased power of 150 kW.

The influence of an accumulator on the size and capacity of the boiler plant and on the generation of power from process steam is shown in the case of a cane-sugar refinery: The provision of a 700-h.p. boiler to cope with the peak loads was obviated, and the cost thus saved will pay for the entire accumulator system; the insufficiency of process steam at times and an excess at other times are obviated, thus giving the turbines a constant supply. The saving, as compared with hydro-electric power previously used, amounts to £16,000 per year, and the cost of generating power by process steam amounts to only 6 per cent. of the total fuel cost, plus depreciation and upkeep of the necessary equipment.

In the case of industries which chiefly consume steam, using little or none for process work, such as iron and steel works, the accumulator has to store steam and deliver it to the turbines at peak times, but it is dry saturated steam, whereas it is desirable that it should be superheated. Therefore, another accumulator is added for storing superheat, working on the same principle as the well-known Siemens regenerative heater.

The following example shows how an accumulator system can be designed to suit the most diverse requirements:—The municipal electric power plant at Malmö, Sweden, purchases hydro-electric power which is delivered over a long transmission line. Due to frequent disturbances, a stand-by was required capable of carrying at least the electric load for lighting and street railways. For this purpose a large lead storage battery was installed originally, and some of the boilers in the steam plant were always kept under pressure. So as to save the cost of keeping the boilers under pressure, a Ruths steam accumulator was installed, as shown diagrammatically in fig. 4.

Two accumulators of 8,000 cubic feet volume each, with a capacity (together) of 80,000 lb. of steam, on a pressure drop of from 114 to 28 lb. per sq. in., are kept under pressure, the cooling losses being taken care of by a small electric boiler. Further, a specially designed condensing steam turbo-generator of 3,750 kW has been installed. The generator end of this set normally runs as a synchronous condenser, but as soon as a break occurs in the supply of hydro-electric power, the speed governor on the turbine opens valve $V_2$, admitting steam from the accumulator to the turbine. The load will thus be instantly carried by the turbine, and no disturbances will be felt in the supply of electrical energy for lighting and street cars. In order to maintain the highest efficiency on the turbine, the steam from the accumulator is passed through the first stage until the pressure drops to 67 lb. per sq. in., at which pressure

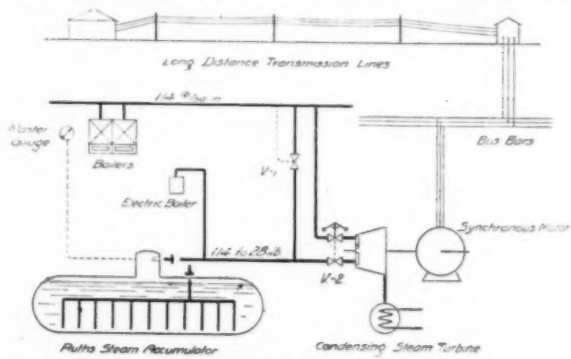


Fig. 4.—Electric Stand-by Plant at Malmö, Sweden.

the steam is by-passed the first stage, and enters the second stage direct until the pressure drops to 42 lb., when it enters the low-pressure stage direct. The accumulator installation is big enough to furnish steam to the turbine for one hour, developing about 3,000 kW, which is sufficient time for the boilers to be started; as soon as the pressure has been raised, the boilers will supply the turbine until the hydro-electric supply is restored, when the boilers recharge the accumulator through valve $V_1$ and are then shut down again. The installation has been so successful that another municipal power station in Sweden has built a plant of the same type, and other authorities contemplate similar stand-by arrangements.

We know how to produce cheap steam; coal is being burned in powdered form with a monthly efficiency of 92 per cent. The next step will be the carbonisation of coal before it is burned, but it is not sufficient merely to produce cheap steam, for it is in economy in the use of steam after it is produced that the greatest savings in industry will be effected. This is the largest field for the accumulator, and its development is intimately bound up with the study of exhaust steam engineering.

The paper concludes with a bibliography of the subject and a detailed list of the 217 accumulator installations that have been ordered since 1916. The largest has a steam capacity of 100,600 lb. and the smallest 77 lb., most of which are, or will be, used in Europe. There are four installations in Canada, three in Scotland, and one each in Newfoundland, the U.S.A., and Brazil. Practically all industries are using accumulators, in addition to such establishments as a hospital, a university, printing offices, &c., and the ten installations ordered for use in electric power stations will have a total steam capacity of 628,500 lb.

# Empire Wireless Communication.

### An Outline of the Progress Achieved Since the War.

By W. H. ECCLES, D.Sc., F.R.S., M.R.I., M.I.E.E.

(*Abstract of discourse before the* ROYAL INSTITUTION OF GREAT BRITAIN.)

THE British Empire is a medley of fragments spread as if by blind chance over the habitable portions of the globe. For so dispersed a family the problem of telegraphic communication is important and difficult. Quite early in the development of wireless telegraphy the principal nations began to regulate its employment. Indeed, control was compelled, in the armed camp that Europe then was, by the consideration that, when war came, wireless would be useful to fleets and armies and dangerous in the hands of spies. In peace time even some degree of control was called for to reduce interference, especially between powerful long-range stations. Each such station ought, in fact, to transmit on a different wavelength from other stations; and once a wavelength is assigned to a particular long-range station, it should not be given to any other. In other words, the grant of a wavelength to a powerful station is equivalent to giving a right-of-way to that station. For all these reasons the Imperial Conference of 1911 declared that wireless communication within the Empire should always be regulated with especial care, and that, in the main, the necessary stations should be State-owned and State-operated.

In contrast with our inaction, the United States pressed on with the construction of several large Government stations, and France and Germany made great progress with their respective Colonial plans.

Germany had made great strides with her Colonial communications between 1912 and 1914. She had established thoroughly modern stations in Togoland, in German East Africa, in German South-West Africa, and in the Pacific. The three African stations could intercommunicate with one another, and, to a limited extent, with the great station at Nauen, near Berlin; the Pacific station was at Yap in the Caroline Islands. It was a noteworthy coincidence that all these stations were completed just before the war began. I remember hearing the early trial signals from Yap while I was sailing across the Pacific in July, 1914, and it may be of interest to recall the fate of the station, which I remember because I was called from Sydney to Melbourne by the Australian Government to help in an advisory way with an interesting application of wireless. At that time the German fleet was cruising to the north of Australia and was in nightly touch with Yap. As soon as this was observed each of the small shore stations along the Australian coast was instructed to listen for the signals of the German fleet, to record the strength with which the signals were received, and to report daily to Melbourne. From the reports, by a process resembling triangulation, an estimate was made in Melbourne of the changes of position of the German fleet. Meanwhile an Australian naval force left Sydney with the object of destroying the wireless station at Yap, which was duly accomplished, and for days afterwards the German fleet, unaware of the disaster, continued to call the dead station, in vain. The continued calls, by helping us to keep track of the fleet, eased the anxiety of those who knew that the New Zealand expedition was then well on its way to capture Samoa.

The war closed without any progress in Imperial wireless: the Governments of the British Empire, at the close of the war, possessed only one large station among them—that at Windhuk in German South-West Africa—captured by the forces of the Union of South Africa under General Smuts. Thus at the end of 1918 the Empire was far behind most other great Powers as regards Government-owned stations, and, by the way, equally far behind as regards powerful commercial stations.

Within a year of the conclusion of the war, Lord Milner appointed a Committee, under the chairmanship of Sir Henry Norman, to investigate afresh the problem of establishing a comprehensive wireless network. The Committee's report was, clearly, somewhat ahead of its time, but not, I think, too far ahead, for only five years later the Post Office station at Rugby* has been built with thermionic valves yielding double the output recommended by the Committee. The Rugby station, besides, has shown what the Norman Committee's stations could have done. The station is full of novel features, and includes apparatus for transatlantic telephony. The ultimate aim of this experiment is to connect any telephone subscriber in this country to any subscriber in the United States and Canada. By aid of the telephone circuits already constructed between England and the Continent it may be found possible later to connect anyone in Western Europe to anyone in North America through Rugby. The Rugby station when in full swing will probably be able to transmit simultaneously three long-distance telegrams and a telephone message.

When one realises that this multiple service station has cost only about half what the single service station near Bordeaux (France) cost in 1919, one appreciates the great strides that wireless design has made during the past few years. Rugby, in fact, has cost about £400,000, much less than even the new stations at St. Assise, near Paris, and on Long Island, near New York. Further, as the Leafield station began to earn within a year of its opening more than covered its working expenses, so we may reasonably look forward to the Rugby station soon becoming a profit-earning concern.

The telegraphic traffic to and from the centre of the Empire will be greater than that to and from any of the Dominions, for the spokes all meet at the hub of the wheel. Therefore Britain must make much greater provision than even the largest Dominion, perhaps tenfold. The English "beam" stations for communicating with four Dominions will cost altogether about half as much as Rugby. For this expenditure good communication is guaranteed for a daily average of 18 hours with Canada, 7 hours with Australia, 11 hours with South Africa, and 12 hours with India. We only know enough so say that both systems will be useful, and that each can do something the other cannot.

Before the end of this year the long-range wireless transmitting equipment of the Empire will include—

(1) The multiple station at Rugby, comprising:—
  (*a*) Long-wave plant of world-wide range.
  (*b*) Long-wave plant of medium range.
  (*c*) Short-wave plant of world-wide range.
  (*d*) An experimental telephony plant of range 4,000 miles.
(2) Medium-power stations for long and short waves at Leafield (Oxfordshire) and at Abu Zabal (Egypt).
(3) Four "beam" circuits for communication between England and the four largest Dominions.

Thus the Empire will shortly possess the most up-to-date wireless equipment in the world, and preparations ought to be made to utilise fully the new facilities. For instance, twice a day Rugby transmits a summary of news prepared by the Foreign Office, and conceivably other news services may be arranged. If I were a settler in Uganda, or the owner of a remote sheep station in Australia, I should install a simple receiving set and so keep in touch with the world, but this implies learning the Morse code, and therefore in small communities where there is a local news sheet it would be more practical to organise a receiving service by paying an operator to listen regularly and decode the messages for the printer. In the Empire there are innumerable remote settlements to which the cabled news messages leak very slowly, and there are many which depend entirely for their news on the occasional visit of a ship. All such outposts can now, by aid of a simple receiving set, be made to feel that they are within five minutes of Fleet Street. Moreover, if these stations were registered messages could be specially addressed to them from England just as telegrams are going from Rugby to-day to ships on distant oceans.

Another method of distributing the Morse messages from home when received, say, in New Zealand, is to announce them, after decoding, through the local broadcasting stations. I refrain from prophecy, and am now speaking of what can certainly be accomplished to-day by mere organisation of existing facilities.

* See ELEC. REV., April 23rd, 1926.

**A Hydro-Electric Governor.**—Some particulars are given in the *Imperial Industrial Review* of the Cox-Walker hydro-electric governor produced by Messrs. Cox-Walker & Partners. The operating element of this apparatus consists of a special balanced beam (used with the Taylor Scotson pressure regulator) maintained in a horizontal position by means of pilot solenoids, adjusted to the desired voltage. The slightest movement of the beam due to voltage variation closes special non-sparking contacts (provided on each side of the solenoids), which also close in turn one of two relays and the circuit of a small motor. The motor starts up in a direction depending on which relay is operated, and brings into action a series of contacts which cut in or out a number of resistance units, thus adding or deducting artificial load as the actual load varies. The beam is claimed to be sufficiently sensitive to maintain a pressure accuracy of 1 per cent., although in order to limit the number of contacts required, 2½ per cent. is the figure usually adopted. The artificial load may, of course, be put to some useful purpose. A suggestion is that the load be used for central heating, a suitable heater being designed with a number of elements which may be cut in or out. The system also includes a device which, in the event of a sudden drop of load, for instance, a break in a loaded transmission line, trips the breakers and short-circuits the generators' fields. An equipment of this description controls the hydro-electric supply of the Coniston Electric Light Co., Lake District, no mechanical governor being provided on the 40-h.p. Pelton-wheel turbine.

# The Electricity (Supply) Bill.

## The Proceedings in Committee.

(*Continued from page 760.*)

ON May 18th Standing Committee C of the House of Commons resumed consideration of the Electricity (Supply) Bill. Sir Robert Sanders presided.

Discussion was continued on Clause 1, which proposes the constitution of a Central Electricity Board, consisting of a chairman and seven other members appointed by the Minister of Transport.

Mr. G. BALFOUR (Hampstead, U.) moved an amendment to provide for the appointment of the Board by "the Lord Chancellor, after consultation with the Association of British Chambers of Commerce, the Association of Municipal Corporations, the Incorporated Association of Electric Power Companies, and the Provincial Electric Supply Committee," instead of by the Minister of Transport. Mr. Balfour said that this form of words would ensure the appointment of an absolutely impartial body, free from any taint of being influenced by the companies, corporations, or any particular manufacturing or trade interest.

Sir D. HOGG, the Attorney-General, in resisting the amendment, said that the Government could not agree to the appointment of the Board by the Lord Chancellor instead of the Minister of Transport. Under the 1919 Act electricity was specifically assigned to the Minister of Transport as his particular subject. The appointment of such a Board had nothing whatever to do with the Lord Chancellor. The list of bodies mentioned with regard to consultation was not the most exhaustive that might be chosen. He imagined that Labour would want to be consulted in the matter. There was an amendment, standing in the name of Sir Philip Dawson and Mr. Hannon, to provide that the Board should be appointed by the Minister of Transport after consultation with representatives of local government, electricity, commerce, industry, transport and labour. When that amendment was reached he proposed to ask the Committee to accept it. The Government agreed that it would be helpful that there should be some sort of consultation before the appointment of the Board.

Mr. HARDIE (Glasgow, Springburn, Lab.), in opposing the amendment, alleged that its proposals showed that Mr. Balfour and his friends were not caring so much for the national interests as that certain private interests should be represented on the Board. He feared that the technical side of the Board would be subordinated to the commercial side.

Sir PHILIP DAWSON (Lewisham, W., U.) said that under the amendment, somebody who knew nothing at all about electricity would be the person to appoint the members of this most important Board. If this Board were purely a judicial body, if it were a court of arbitration which he understood the Attorney-General had said would be appointed with regard to appeals, then he could understand the suggestion that the Lord Chancellor should make these appointments. But the Bill was intended to improve the very bad conditions of electricity supply in this country, and if those conditions were to be improved then those who knew most about the supply of electricity and who had devoted a great deal of time and trouble to it, that was to say, the Minister of Transport should have the appointment of the gentlemen who would form the administrative body. For that reason, he thought the suggestion that the Lord Chancellor should appoint the Board was not satisfactory. It was quite untrue to say that the Electricity Commissioners had been the creatures of the Minister of Transport.

Major GLYN (Abingdon, U.), who also opposed the amendment, caused much laughter by declaring that Mr. Balfour did not appear to trouble whether the Archbishop of Canterbury or the Chief Rabbi appointed the Board, so long as the Minister of Transport did not make the appointment.

Eventually Mr. Balfour's amendment was withdrawn.

Sir Philip Dawson's amendment, providing that the Minister of Transport should appoint the Board "after consultation with such representatives or bodies representative of the following interests as the Minister thinks fit, that is to say, local government, electricity, commerce, industry, transport and labour," was then considered.

Mr. A. HOPKINSON (Mossley, Ind.) appealed to the Committee to do away with "eye-wash about Labour," who were the least capable of running such a Board, and who knew nothing about the matter. This view, however, was not shared by the other members of the Committee.

Sir D. NEWTON (Cambridge, U.) was anxious as to whether the adoption of the amendment would ensure adequate representation for the municipal corporations. He pointed out that the evidence given before the Weir Committee showed that 248 generating stations were owned by local authorities, as were 278 authorised undertakings to supply power. Local authorities had no less capital than £103,000,000 invested in the electricity business.

Mr. LOOKER (Essex, S.E., U.) asked whether the Minister of Transport would consult representatives of the gas companies in the appointment of members of the Board? Representations had been made to him from gas interests in his constituency. There could be no doubt that the gas companies had rendered inestimable services to the community in the past, and they were apprehensive that those services might be affected by the provisions of the Bill. The gas interests were capable of giving extremely valuable co-operation and assistance; they were not opposed to the Bill, but were only too anxious to co-operate and assist.

Col. ASHLEY, the Minister of Transport, said that he had already on several occasions had interviews with and communications from the representatives of the gas industry, and he had found them very reasonable and not disinclined to help. In the amendment the words "commerce and industry" were included, and that would enable him to consult with the representatives of the gas industry. He certainly would consult with those representatives.

Mr. LAMB (Stone, U.) hoped that the interests of agriculture would not be neglected. Agriculture was vitally interested in the Bill. Agriculturists would become large consumers of electricity, and the main transmission lines would have to be laid largely over agricultural property.

Col. ASHLEY said that he could consult with anybody; the amendment did not exclude that; it simply said that he should consult with certain interests.

Mr. CLAYTON (Widnes, U.) feared that the amendment would lead to the appointment of delegates from the various interests consulted. It would be much better to leave the Minister free to consult whom he liked.

Mr. E. HARMSWORTH (Thanet, U.) also feared that the Board might become a debating society, incapable of executive action.

The amendment was, however, carried.

Mr. A. ALEXANDER (Sheffield, Hillsborough, Lab.) moved:—"A person shall be disqualified from being appointed or being chairman or a member of the Board, if he has, directly or indirectly, any share or interest in any undertaking for the supply of electricity, or any undertaking for the manufacture or sale of machinery, or plant, or materials for the generation or transmission of electricity, other than as a ratepayer in the case of an undertaking of a local authority." He explained that his object was to obtain absolutely impartial treatment by the Board.

Col. ASHLEY said that the Government could not accept the amendment, which would introduce a very new and very undesirable feature in our public life. If one could not trust gentlemen of distinction, members of the Board, to carry on the commercial activities of that Board without partiality simply because they might have a few hundred pounds invested in some electricity undertaking, then one had better put up the shutters on the old country.

In the discussion which followed, Sir G. HUME (Greenwich, U.) said that the men to be appointed on the Board would be those who were in close contact, either commercial or industrial, with electricity. If the amendment were drawn on the lines that, a member having been appointed, should dissociate himself from anything that would affect his judgment in the work he had to carry out, then that would be another matter, and might well be supported. But to expect an individual to dissociate himself from every one of his activities in life before he was appointed to the Board was quite unreasonable.

Some other Unionist members took this view, and Mr. R. HUDSON (Whitehaven, U.) suggested that the amendment might be withdrawn, and a new clause, embodying the principle of the amendment, might be moved on the report stage of the Bill.

Mr. R. G. ELLIS (Wakefield, U.) while not opposed to the principle of the amendment, pointed out that it would make a very drastic cut of all those interested technically in electricity, and its passage would make it exceedingly difficult to appoint a Board. He thought that, if the amendment were withdrawn, it would be possible to devise some form of words to prevent any suspicion of corruption.

Sir D. HOGG, however, said that he could not give any undertaking in the matter on behalf of the Government.

The amendment was rejected by 33 votes to 14, and the Committee adjourned.

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On the proceedings being continued on May 20th, Mr. ATTLEE (Limehouse, Lab.) moved that "a person shall be disqualified from being appointed chairman or a member of the Board so long as he is a member of either House of Parliament." He maintained that this disqualification was necessary in order that members should be absolutely independent. Otherwise, there might be a return to the evil days of the 18th century in which the Government could command an obedient body of henchmen in Parliament.

Sir D. HOGG said he could not possibly accept the amendment. He could conceive no valid reason why, because a man happened to be a Peer and therefore, whether he liked it or not, a member of the House of Lords, he should be disqualified from taking any part in the management of the Board. With regard to members of the House of Commons, a different question was involved. He had himself put down for consideration later a proposal to add words which would allow members of the Board to be members of the House of Commons. He had done so advisedly, because he felt that, although the question of profit under the Crown was not an easy one to decide on, it was probable that the existing qualifications would be wide enough to prevent a member of the House of Commons who held an office of profit under the Crown from accepting office on the Board unless words were inserted permitting him to do so. The important question of principle

whether members of the House of Commons should be eligible could properly be decided by the Committee without any pressure from the Government.

Mr ATTLEE thereupon amended his amendment so as to disqualify only members of the House of Commons.

Sir D. HOGG then urged that it was undesirable to fetter the choice of the Ministry of Transport in setting up the Board by excluding members of the House of Commons. It was a mistake to think that when the scheme was started, the Board was going to have such a tremendous amount of work put upon it as some members of the Committee seemed to think. Once the Board began to function, the work of its members—the chairman might be in a different position—would not be very arduous. It would be work of supervision, analogous to that of a board of directors. He did not think anyone could hold that there was any substantial danger of members of Parliament being seduced from their independence by appointment to the Board.

Mr. HANNON (Moseley, U.) agreed that it would be a great mistake to impose a condition that might exclude from the Board men of high business ability and experience.

Sir F. HALL (Dulwich, U.), however, supported the amendment, pointing out that members of the Board could be drawn from the whole financial, commercial, and industrial world.

Mr. G. BALFOUR (Hampstead, U.) also thought it undesirable that M.P.'s should be members of the Board.

Lord ELVEDEN (Southend-on-Sea, U.), on the other hand, thought that, in the interests of fair play and good management, some members of the Board should be members of the House of Commons.

After further debate, the amendment to exclude M.P.'s from membership of the Board was carried by forty votes to eight.

Mr. A. ALEXANDER (Sheffield, Hillsborough, Lab.) moved the following amendment, which was accepted by the Attorney-General, and agreed to:—"The chairman of the Board and any member of the Board who is, by the terms of his appointment, required to devote the whole of his time to the performance of his duties under this Act, shall within three months after his appointment sell any securities which he may hold for his own benefit in any company carrying on the business of supplying electricity or the manufacture or sale of machinery or plant for the generation and transmission of electricity It shall not be lawful for the chairman or any such member of the Board whilst he holds office to purchase for his own benefit any securities in any such company, and if the chairman or any such member of the Board, under any will or succession, becomes entitled for his own benefit to any securities in any such company, he shall sell them within three months after he has so become entitled thereto. Any member of the Board who, by the terms of his appointment, is not required to devote the whole of his time to the performance of his duties under this Act shall, if he is interested in any company with which the Board has or proposes to make any contract, disclose to the Board the fact and nature of his interest, and shall take no part in the deliberations or decisions of the Board relating to such contract, and such disclosure shall be forthwith recorded in the minutes of the Board."

Mr. BALFOUR withdrew an amendment to delete from the clause the provision that the Board should be a body corporate with power to hold land without licence in mortmain.

Sir D. HOGG explained that the Board could not build transmission lines without this sanction.

Mr. LANSBURY (Bow and Bromley, Lab.) moved an amendment to provide that the chairman of the Board, instead of holding office for not less than five years, should hold office "during his Majesty's pleasure."

Sir D. HOGG, in resisting the amendment, said that it would mean that the chairman and the members would be liable to dismissal without notice in the event of a change of Government.

Mr. LANSBURY said his object was to ensure that if a chairman proved unsuitable he could be replaced without waiting for five years.

Sir D. HOGG replied that in the event of misconduct a chairman would be in much the same position as a managing director.

The amendment was negatived.

On an amendment to make the period of office of a member of the Board not less than seven years instead of not less than five years, Sir D. HOGG said that, in order to remove any fears that might exist as to the possibility that at the end of five years, if there was a general election, they would have to have a new Board, he would introduce into the Bill a provision for a maximum period of office of ten years. The effect of this would be that there eventually would be a graduated period of office and they would thus constantly be having fresh blood on the Board.

Sir D. Hogg's amendment to make the period of office not less than five and not more than ten years was then agreed to.

Mr. GRANT (Derby, S., U.) moved an amendment to ensure that the salaries, &c., of the chairman and members of the Board should be under the control of the Treasury instead of being determined by the Ministry of Transport, but Col. ASHLEY pointed out that the Treasury did not desire control, as that would mean that the Board would be a State service, which they did not want. It was to be an independent Board, carrying on its own affairs, and Government control was provided by the fact that the Ministry of Transport was responsible to and subject to the criticisms of the House of Commons.

The amendment was negatived, and Clause 1, as amended, was added to the Bill.

The Committee then adjourned until Thursday, June 3rd.

*(To be continued.)*

# The Electric Propulsion of Ships.

## The Equipment of a 17,000-h.p. Twin-screw Passenger-cargo Liner.

*(Abstract of a discussion before the* NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.)

THE following is an abstract of the discussion on Mr. Eskil Berg's paper on the above subject, which was abstracted in our issue of February 26th, 1926.

MR. STANLEY S. COOK thought there must be some special reasons to account for the fact that electric propulsion had made more headway in the United States than in this country; no doubt it was due to its adoption by the U.S. Navy, but it certainly did not appear to be entirely on the score of economy, as far better results had been obtained with geared-turbine warships, even in the United States. The author based his case on a statement of disadvantages of the geared turbine installation, which was misleading and incorrect. What was the complication of a few fixed steam pipes when compared with the control system and elaborate switchgear which were necessary in an electrical installation? For the new liner of 17,000 s.h.p. which was being built for the International Mercantile Marine, the steam consumption expected was to be 0.85 lb. of oil per s.h.p., but in some recent Orient liners of about the same power fitted with mechanically-geared turbines better results than this had already been obtained; for example, the *Orama*, which was built two years ago, consumed 0.785 lb. of oil per s.h.p., or nearly 10 per cent. less than the author's figure, and this result had been well maintained in subsequent service. In another of these liners, the oil consumption was 0.82 lb. per s.h.p. without the use of superheat. These installations had three turbines driving each propeller shaft through single-reduction gearing.

MR. E. A. EBORALL said that it was stated that double excitation was applied to the generator at starting, when the propelling motor started up as a pure squirrel-cage induction motor. From this one inferred that the motor had two windings, one squirrel cage for running asynchronously, and the other for excitation. At the moment of starting, the slip of the motor would be 100 per cent., and very heavy wattless rotor currents with reduced starting torque would result. In ordinary practice it was usual in the case of large squirrel-cage motors to start them with reduced terminal voltage obtained from a starting transformer, whereas in the present case, according to Mr. Berg, the stator voltage was increased. At reduced speed would the motors operate synchronously or asynchronously? If the former, then the frequency at which the current was generated must be decreased in the same proportion as the propeller revolutions, *i.e.*, at 13½ knots the turbine speed would be reduced by about 26 per cent., and it was rather surprising that in these circumstances the steam consumption should increase by so small an amount as 0.4 lb. per h.p. hour. Apart from reducing the frequency, speed reduction could be obtained by reducing the terminal voltage and increasing the rotor slip of the motors, keeping the frequency, and hence the turbine speed, constant; however, very heavy rotor currents and bad power factor would result, since the slip at a propeller speed of 90 r.p.m. would be approximately 25 per cent. The conclusion was that the reduction of voltage from 4,000 to 3,000 V to which Mr. Berg referred was merely for reducing the iron losses in the machines, and that it was therefore necessary to decrease the turbine speed for reduced ship speeds, which put electric propulsion on precisely the same basis as the geared-turbine drive in the matter of economy at reduced speeds. In the U.S. battleships the difficulty was got over by arranging the main motors to operate with a 24-pole or 36-pole connection, and speed reduction was obtained without loss of turbine efficiency. Another difficulty was that, when a ship was under helm, the largely-increased load on the inner screw might amount to 50 per cent. at full helm. Presumably, when this condition arose, the motor on the inner shaft pulled out of step and ran asynchronously. The alternator load increased and the turbine governor opened to maintain constant speed. What was there to prevent a severe overload on the alternator? If the machine had to be dimensioned to carry this overload, its weight was increased and efficiency at normal load reduced.

MR. W. D. HORSLEY said that care must be taken with the insulation to withstand the atmospheric conditions at sea, by the adoption of a closed ventilating system. A disadvantage of electrical transmission was that a large number of links were introduced between the prime mover and propeller. A simple fault, such as a break in the exciter shunt-field circuit, would shut down the installation. It was not made clear in the paper whether the field rheostat and exciter losses were included in the excitation losses. When operating at the lower speed not only were the iron losses reduced, but also the windage losses; the latter formed a large percentage of the losses. Has the author considered leading the hot air from the generator to the f.d. fan inlet? A certain proportion of the alternator losses would be recovered, but the advantages of the closed-air circuit would be lost. Would one turbo-alternator be of sufficient capacity to start and reverse two motors?

### Written Contributions to Discussion.

MR. P. L. JONES stated that the author's statement that "mechanical gears for large power require a multitude of turbines and pinions" was an exaggeration. In H.M.S. *Hood*, for instance, 150,000 h.p. was arranged on four shafts, there being eight turbine casings altogether, and there were numerous examples of ships developing over 20,000 h.p. on each shaft. The figure given by the author of 300 tons of fuel per day for a 50,000-h.p. installation, including everything on board, might appear very optimistic, but it was possible of attainment in the near future. The author's weights of the main machinery for his 17,000-h.p. turbo-electric scheme were low, but not as low as could be obtained with geared turbines. With single-reduction turbines the weight could easily be brought below 30 lb. per h.p., and with double-reduction considerably lower still. It was difficult to understand how the turbo-electric scheme could be cheaper than geared turbines. The foundations for the turbines and the generator might be less costly than for the geared turbine, but the motors would require a good deal of extra expenditure in structural additions to the after portion of the ship which were not necessary in the geared-turbine scheme. The steam consumption appeared to be rather high.

MR. C. S. DARLING said it was certainly unsafe to neglect the possibilities of such a scheme as that made available by electrification. "Experiments were carried out at the outbreak of the Great War; in fact, we may claim to have made some of the earliest experiments in this line on this river with the *Tynemouth* in 1914," he wrote, and was surprised that Mr. Berg's company proposed to vary the propeller speed by varying the turbine speed, presumably to use commercial windings; but was that economical? The robustness and mechanical construction of the squirrel-cage induction motor caused designers to favour the a.c. system almost solely on this account. In this connection the following scheme did away with the bogey of the a.c. system, *i.e.*, constant speed, and permitted of a greater speed range than was otherwise possible. Assuming one synchronous generator with 10 poles; output 590 kVA (one-hour rating) at 350 r.p.m., 500 volts, 29.2 cycles per second, the efficiency at unity power factor at cos $\phi$=0.80 would be output 590 kVA, 94 per cent.=92.5 per cent.; output 360 kVA, 93 per cent.=92 per cent. Combined with an asynchronous generator mounted on the same shaft with 6 poles, fed on the primary side by the above synchronous generator, and producing on the secondary side in accordance with the sense of rotation a three-phase current of 46.6 or 11.6 cycles per second:—Speed of rotor=350 r.p.m.; output at 46.6 cycles=500 kW (one-hour rate); output at 11.6 cycles=240 kW (one-hour rate). Efficiency at 590 kVA and power factor=0.92=91 per cent. This could be connected to one or more three-phase squirrel-cage motors absorbing the above power at the one-hour rate at 500 volts and at 29.2 cycles per second developing 150 r.p.m. approximately. Corresponding to this and the periodicities available, six speeds could be obtained with the following efficiencies (motors of two-speed pole change-over type with 12 and 24 poles and a single-stator winding):—

| Periodicity. | No. Poles. | r.p.m. | Output Per cent. | Efficiency Per cent. | Power Factor. |
|---|---|---|---|---|---|
| 11.6 | 24 | 58 | 40 | 87 | 0.6 |
| 11.6 | 12 | 117 | 40 | 87 | 0.68 |
| 29.2 | 24 | 150 | 100 | 90 | 0.84 |
| 46.6 | 24 | 233 | 100 | 90 | 0.84 |
| 29.2 | 12 | 292 | 100 | 90 | 0.90 |
| 46.6 | 12 | 466 | 100 | 90 | 0.90 |

These motors would be of the totally-enclosed pipe-ventilated type requiring each a cooling air quantity of about 0.2 metre$^3$ per minute per horse-power, at a pressure of about 50 mm. water column. For the synchronous generator it was necessary to provide an exciter that could have its terminal pressure adjustable from 120 to 270 volts. The exciter would be separately excited at from 30 to 50 volts. A d.c. generator of 30 to 50 volts and 700 amperes would be fitted for generating, exciting, controlling, and lighting current and for a storage battery used for emergency starting of the main engin , and for normal starting of the d.c. generator.

The control would be effected as follows:—Speed control of motors and reversing by means of pilot control with blow-out drum electrically connected to main controller with remote control gear and interlocked with reverser. Economical speeds with constant prime-mover speed would be not less than six. For every change from a lower to a higher speed, the three-phase voltage would be first reduced by means of a small shunt controller which would directly govern the excitation of the synchronous generator. The master controller would then, by pilot control, be put on next speed notch and voltage again normalised. By this means it was possible to reduce the current rush to a minimum not exceeding normal working current and also to get gradual acceleration, which could be increased by not lowering the voltage of the synchronous generator too far, or by rapidly raising the voltage again.

### Author's Reply to Discussion.

The only battleship in the United States Navy with geared turbines was the small *North Dakota*, which was equipped with Parsons turbines and gears made from designs furnished by Parsons in England. While this ship was of only 20,000 tons displacement, as compared with 32,000 tons of the *New Mexico*, it consumed more fuel at all speeds, from the lowest to the highest. This fact might have had something to do with the U.S. Navy's adoption of electric drive for this type of ship. He took exception to Mr. Cook's statement that turbine development showed that the best results were obtained by putting two or more turbines in series. Very large turbines of 50,000 kW and over must be split, but what kind of economy would be obtained from a 5,000-h.p., 1,800-r.p.m. machine built in two or more casings? With regard to the International Mercantile Marine liner, 0.85 lb. of oil included a load of over 1,000 kW on the d.c. generating sets. This ship had a very large refrigerating plant—over 500 h.p. Without refrigeration and the elaborate ventilating system required for the passengers in tropical climates, there would be no difficulty in obtaining as low as 0.788 lb. of oil per shaft-horse-power. On account of the weight, he did not as yet advocate electric drive for destroyers or light cruisers, but if higher frequency than was now used on generators were adopted, the weight might come within reach. The United States Navy was most anxious for electric drive, even for the light cruisers; the great economy at cruising speed was what the Navy desired. The new International Mercantile Marine liner had synchronous motor drive. All manœuvring would be done with the motor acting as a squirrel-cage induction motor, but, as soon as the motor reached synchronous speed, it became a pure synchronous motor. The success of this type of motor was so great, and it had so many advantages, that the General Electric Co. proposed only this type, except where economical cruising speeds were required, as on battleships, where induction motors might work better, although with slightly poorer efficiency. Speed variation by varying the turbine speed was by far the simplest and most efficient method known. There had never been the slightest damage to any of the *New Mexico's* electrical machinery; in fact, all ships built by the General Electric Co. for the Navy had so far given 100 per cent. operation. The mishap to the battleship *Tennessee*, the first electric ship built by the Westinghouse Manufacturing Co., was caused by a bolt or piece of steel getting into a motor and wrecking the winding. The accident had absolutely nothing to do with the salt air. Some of the largest power houses in the world, and a great majority of them, were located near salt water, where the ocean water was used for condensing and the air for ventilation. High-voltage machines had been run for years in such places, so no fear need be felt on that account. There was no difficulty in handling 4,000 volts on shipboard, and on ships running now no trouble had been experienced. In excitation losses the field rheostat was included, and in the fuel consumption the efficiency of the exciter was included. One turbo-generator would reverse and operate both motors up to a speed of almost 15 knots. 73.2 per cent. turbine efficiency was low and conservative, but was the guaranteed value. A better result was, of course, expected. Mr. Darling's scheme for obtaining speed variation was not necessary for a passenger ship.

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**A Spanish National Power Scheme.**—The Madrid correspondent of *The Times Trade and Engineering Supplement* states that a recent Government decree created five principal hydraulic basins, corresponding to the great rivers, the first of which—that of the Ebro—is now in course of organisation. All the hydraulic works whether for power, irrigation, or navigation, will be co-ordinated by the Basin Commission. Then will come the linking of one basin system to its neighbours with the object of forming a national unified system. Unification of transmission voltage, standardisation of machinery and facilities for distribution, are some of the advantages hoped for from this system. The distribution lines planned total about 1,400 miles, and their estimated cost is about £4,000,000. Barcelona, where electrification is well advanced, will be the starting point of a line along the foothills of the Pyrenees, *via* Tremp and Jaca to Bilbao, the second great centre of consumption. Thence the line would run to the Duero, where it forms the frontier with Portugal, Alcantara on the Tagus, Rio Tinto, Seville, Granada, Valencia, and back to Barcelona. Branch lines would link this circle with Madrid. On the lines from Granada to Madrid and Madrid to Tortosa, exist fields of poor coal near Almodovar del Campo in the Province of Ciudad Real and near Montalban in the Province of Teruel, where thermal stations would be established. Three-phase transmission at 50 periods and 120,000 V is proposed. It is calculated that Spain has available about two million h.p. of utilisable water power. There is not at present in Spain a market for anything like this amount of power, and unless general electrification of the railways is undertaken, which would require a capital outlay far beyond the present financial capacity of the companies, it is not likely that there can be for many years to come, even with intensive irrigation.

# The National Physical Laboratory.

## Annual Report for the Year 1925.—*Abstract.*

THE annual report on the work of the National Physical Laboratory for the year 1925 * indicates that development continued in a satisfactory manner In addition to a good record of research accomplished, the additional provision made for the maintenance of standards of measurements as well as of the quality of performance enabled some arrears to be overtaken; the demands on the Laboratory made by the various Research Boards and Committees of the Department of Scientific and Industrial Research continue to grow, while the volume of tests and investigations carried out for firms and other outside bodies has been well maintained, and the work done for other Government Departments showed a slight increase. The total number of tests carried out was 654,288 (as compared with 683,545 in 1924), the electricity department, including photometry, accounting for 3,674 (against 2,981).

*General Research.*—The report of the Executive Committee indicates that the investigations in progress in the Physics Department, under this heading, relate mainly to problems of atomic physics and to acoustical measurements. In the Radiology Division work has been continued on the structure of intermetallic compounds, and the properties of single crystals have been studied in collaboration with the Metallurgy and Engineering Departments. The researches on the scattering of gamma rays and on X-ray absorption are also proceeding. Considerable advance has been made with methods of sound measurement: Satisfactory results have been obtained in the measurement of the sound-absorbing and reflecting power of materials; the values obtained for different materials have been shown to be practically independent of the position in the transmitted or reflected beam at which the observations are made. Improved methods of carrying out reverberation tests have been devised, using a loud speaker as the source of sound; telephonic apparatus for measurements of sound intensity have been improved, and microphones based upon electromagnetic, electrodynamic, and electrostatic principles have been tried.

The research programme in the Electricity Divisions has been somewhat restricted owing to the large amount of other work in hand, much of which falls under the heading of "Maintenance of Standards." In the Electrical Standards Division interesting observations have been made in relation to certain properties of dielectrics: when a metal face slides over the surface of an imperfect dielectric, there is a sudden change in the frictional force opposing the motion when a current passes across the faces of contact; the bearing of such phenomena on the power losses and absorption effects in dielectrics has been investigated, and a paper on the subject has been presented to the Physical Society. Investigation has been made into the properties of insulating materials as employed in standard instruments: the fused quartz used in high-class condensers has been found to deteriorate rapidly under certain conditions and a method of treating it has been discovered which enables condensers to be constructed having very small power losses. Experiments will be continued with a method of measuring the amplification ratio, and the relative phase displacement of the output, with respect to the input, of an amplifying system. The construction of the horizontal force magnetometer for use at the Abinger magnetic station of the Royal Observatory will shortly be completed; preliminary trial of the instrument was made at Abinger with very satisfactory results. Progress has been made with the preliminary work on the vertical force magnetometer. In the Electrotechnics Division the research into the methods of earthing electrical circuits has been continued. Research in the Photometry section has related mainly to the use of the photo-electric cell in place of the eye in the comparison of the light intensity of different sources; as a method of colour matching, the cell has been found, under suitable conditions, to give an accuracy ten times as great as the eye, but difficulty has so far been encountered in securing, with the use of the cell, the necessary sensitivity in the comparison of the relative candle-powers of colour-matched lamps.

In the Engineering Department the research on hardness testing has been continued by the use of diamond cones for producing the indentation in the harder materials, with the aid of the machine presented by Messrs. Vickers, Ltd. In the Metallurgy Department a commencement has been made with the study of the magnetic behaviour of iron, nickel, and cobalt from the point of view of the lattice theory; the line of attack adopted is to compare the effects of dimensional changes produced by magnetisation with those caused by elastic deformation and apparatus for producing, and for accurately measuring, the required magnetic field has been designed in collaboration with the Electrical Standards Division. The study of the crystal structure of metals and alloys, in conjunction with the Radiology Division of the Physics Department, has been continued, and apparatus for X-ray analysis, including a Müller X-ray spectrograph by Messrs. Hilger (the gift of Sir Robert Hadfield) has been installed. Experiments on fatigue have been continued and the experimental work done on the behaviour of metals under plastic deformation at varying rates (ranging from slow compression in a testing machine to compression by means of detonating explosives) has been extended to copper and aluminium.

*Maintenance of Standards.*—The term is necessarily very wide; the additional provision allowed has permitted increased attention to be given to this work during the past year, though, unavoidably, the continuous increase in the demands made on the Laboratory by outside bodies tends to limit the time available for such work. Work on the primary electrical standards has been mainly concerned with the redetermination of the international ohm as defined by the resistance of a column of mercury; the new values of the resistances differed from the previous values by about 1 part in one hundred thousand. Mr. F. E. Smith recently suggested that the time is opportune for the adoption of the absolute electrical units, as defined in terms of the C.G.S. units of mass, length and time, in place of the international units at present employed, and the Executive Committee has appointed a Sub-Committee to give this suggestion careful consideration. The Board of Trade standard one-ohm coil, ampere balance, and voltmeter have been compared with the Laboratory standards and the results indicate that the standards remain in a satisfactory condition.

Much time has been devoted to work on radio-frequency standards and to the use of quartz piezo-electric resonators and oscillators; these possess the particularly valuable properties of simplicity and portability, and at the same time enable selected frequencies to be reproduced with the precision of a primary standard. The Electrotechnics Division has studied methods of measurement and the characteristics of instruments for use in large power installations; new standard alternating-current apparatus has been brought into operation. The general adoption, in lamp specifications, of values of mean spherical candle-power has made it necessary to provide additional sub-standards for such measurements. A comparison of standards has been made with the Bureau of Standards and the Laboratoire Central d'Electricité, Paris, showing good agreement at the temperature of the ordinary carbon lamp; with sources of light of higher efficiency the precision of measurement is reduced, owing to the colour difference between these and the primary vacuum standards, which operate at a much lower temperature.

*Government Research.*—The Department of Scientific and Industrial Research has taken the valuable step of stabilising some researches by sanctioning expenditure over a term of years. The programme arranged by the Illumination Research Committee relates largely to the illumination of rooms, by daylight or artificial light, and the effect of different kinds of illumination on the accuracy, speed and comfort of working. Tests have been made of the efficiency of certain types of diffusing glass fittings for artificial illumination and an investigation into glare in street lighting has been arranged.

*Work for Outside Bodies.*—The total volume of work undertaken, on payment, for outside bodies and firms was, approximately, equal to that of the preceding year. Researches in progress include the study of the effect of impurities in copper. An investigation regarding the presence of oxygen in aluminium has led to the conclusion that oxygen is not soluble in aluminium and that oxide is found only on the surface of the metal. The work on buried cables in the Electricity Department has been continued for the British Electrical and Allied Industries Research Association, and other investigations for this Association are in progress.

*Other Services Rendered by the Laboratory.*—Frequent visits are paid to the Laboratory by the representatives of firms who wish to obtain particulars concerning the methods of test employed by the Laboratory or to gain information which may help them to improve the accuracy of their instruments or the quality of their products. Such intercommunication is not only of value in aiding private firms to bring promptly and effectively into practical use the developments arising from scientific progress, but serves also to keep the staff in close touch with industrial needs. In view of the direct claims on the time of the staff it is difficult to provide adequately for this side of its activities, but the Laboratory strives in this manner, so far as circumstances permit, to place the knowledge it has acquired at the disposal of those to whom it may be of service. Notes on points of interest in relation to the performance of electrical instruments are being collected with a view to publication. Help has recently be given to a firm in the setting up of equipment for carrying out magnetic tests. A large number of visitors is received at the Laboratory from dominion, colonial and foreign institutions, and opportunity is afforded Government technical officers in the Colonies or Dominions to work for a period at the Laboratory in order to acquire familiarity with the methods employed in particular branches of work and with special processes.

*New Buildings.*—The building for high-voltage work was completed in the course of the year and the necessary equipment and connections for the lighting, heating and power supplies are now being installed. Sir Richard Glazebrook visited the United States to see the high-voltage plant which has been

* H.M. Stationery Office. Price 8s. 6d. net.

erected at the research laboratories of the General Electric Co. and elsewhere, in order to advise the Committee. He was accompanied by Dr. Rayner, head of the Electrotechnics Division of the Laboratory, and by Mr. G. Smith of the Engineering Division of H.M. Office of Works, and also visited subsequently the works of the Compagnie Générale d'Electro-Céramique at Ivry, to inspect the million-volt air transformers which have been installed there for insulation testing. Sir Richard's report recommended the adoption of the air transformer as most suitable for research purposes, and H.M. Office of Works is arranging for the supply of the necessary plant. Plans for the proposed new Physics Building have been prepared and congestion in other buildings of the Laboratory continues to increase. The provision of a new building for photometry, to relieve the present congestion in the Electrotechnics Building, is a very urgent requirement.

# New Electrical Devices, Fittings and Plant.

**(Readers are invited to submit particulars of new or improved devices and apparatus.)**

### An Oil Fuse for Rural Use.

One of the hindrances to the development of the rural use of electricity is the difficulty of tapping main transmission lines at small enough cost to render the supply justifiable. Under such conditions an oil fuse produced by MESSRS. FERGUSON, PAILIN, LTD., Higher Openshaw, Manchester, should be of considerable utility. The apparatus, shown in fig. 1, with the fuse element withdrawn from, and lying across, the oil tank, is suitable for service on systems up to 11,000 volts between phases for either indoor or outdoor use. The fuses are of the single-pole type, and each is completely self-contained; the main frame casting is fitted with flanges for the fixing bolts and carries the cable-sealing arrangements and the fixed fuse contacts. Its dome shape ensures strength under fusing conditions and allows an air space above the oil level. The fuse plug is inserted through a hole in the top of this casting, and the oil tank is clamped to the main frame by four down rods. The fuse plug is made of impregnated teak with a galvanised metal holder at the upper end and the fuse contacts at the lower; the fusible element, which passes round the base of the plug, is held in tension between two spring contacts which ensure a rapid break in oil. As there is no operating mechanism, the time interval between the occurrence of a fault and the interruption of the circuit is small, the break taking place before the short-circuit current has attained its maximum value, which fact reduces the duty on the fuse. To insert the fuse

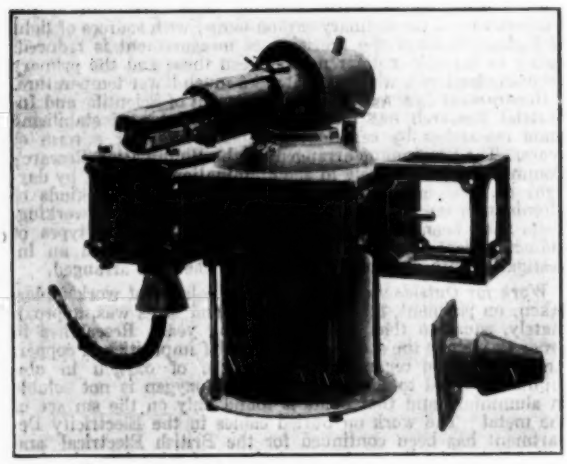

Fig. 1.—An Oil Fuse.

in circuit it is necessary to push the plug fully home, and then turn it, thus locking it in position. Contact is not made until the plug, which is earthed, is turned and locked so that it is impossible for it to be blown out if inserted under fault conditions; v.i.r. cable can be brought right in to the fixed contacts through bell-type porcelain insulators, or cable sealing ends may be fitted.

### Another Vacuum Cleaner.

We have received from the BRITISH ELECTRICAL AND MANUFACTURING CO., 7-13, Clavering Place, Newcastle-on-Tyne, some particulars of the "Orion" vacuum cleaner which it has recently put on the market. The machine is equipped with a suitable suction nozzle, 12 in. long, for use under very low furniture. A specially-designed device is embodied for raising or lowering the nozzle to suit the thickness of the carpet which is being cleaned. A continuous-action rotary pedal switch of robust design is fitted. The bag is conveniently emptied, it is claimed, by virtue of a broad rim which can be held between the edges of the soles of the shoes during the emptying operations. The motor is of the universal type for use on a.c. or d.c. circuits.

### A Portable Lifting Equipment.

The accompanying illustration, fig. 2, is one of a range of lifting appliances, "Diard Lifters," which is being introduced in this country by MESSRS. TRACTOR TRADERS, LTD., 36-37, Queen Street, London, E.C.4. The apparatus is of a portable nature, and its design and construction suggest its suitability for use in lifting transformers and motors from pits. It consists primarily of a cross beam carrying a travel-

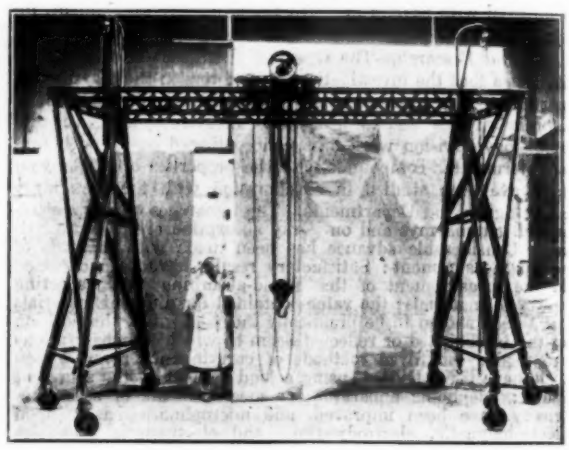

Fig. 2.—Portable Lifting Apparatus.

ling Weston-type block and mounted on suitable tripods. It is made in varying styles of fixed or adjustable height, the latter type being provided with telescopic legs, and with the legs mounted on rollers or not. Plates are supplied for the feet to rest on to prevent sinking on soft ground. It is made in two sizes, with capacities of 1.5 and 3 tons. The travel limits of the whole range varies from 7 ft. 3 in. to 9 ft. 8 in., the minimum and maximum load-hook heights being 6 ft. 5 in. and 11 ft. 4 in. respectively.

### An Improved Ultra-Violet Lamp.

The "Percy Hall Clinic," illustrated in fig. 3, is a lamp which has been recently designed for ultra-violet radiation by the COX-CAVENDISH ELECTRICAL CO. (1924), LTD., 105, Great Portland Street, London, W.1. The apparatus is designed for use with one pair of swaged tungsten electrodes, which provide, it is claimed, the richest output of ultra-violet

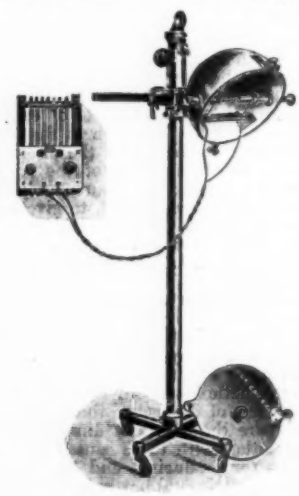

Fig. 3.—Ultra-Violet Lamp.

radiation of any known arc. The desired gap is set in the usual way, but by means of a spring mechanism the arc is struck and set at the required distance. The 14-in. nickel-plated reflector is held in a metal hood, which is

carried on a roller-bearing cross arm. At a distance of 4 ft., it is claimed, the whole body of a normal person may be radiated. The loading of the lamp for the best results is 3¼ to 4¼ A at 240 V d.c. The adjustable resistance enables the lamp to operate on any pressure from 60 to 250 V.

### A Copper Tungsten Electrode.

The GENERAL ELECTRIC CO., of America, has evolved a new welding electrode of copper-tungsten, which is expected to prove of great value in the fabrication of metals, and for which the following claims are made. The alloy has a hardness of 225 (Brinell) as compared with 82 for hard copper and 30 for soft copper, and the compressive strength of the copper tungsten is 208,000 lb. per sq. in., as against 58,000 lb. for hard copper. The tensile strength is 56,350 lb., compared with 30,000 lb. for soft copper and 50,000 to 70,000 lb. for hard drawn copper.

The new material does not anneal at red heat. In view of the higher first cost of copper-tungsten, its chief value is expected to be in special applications. It is particularly adapted for use under severe conditions which copper will not withstand, such as hot-upsetting rivets electrically, and in facings for clamps for rod welding. The durability of the new alloy is shown by a recent test, where the number of welds made with one dressing of a copper die averaged ten, while the first test using copper-tungsten inserts gave more than 1,000 welds with the die still in good condition at the end of the test.

The material, Elkonite, is to be manufactured and sold exclusively by the Elkon Works, Inc., Weehawken, N.J., of P. R. Mallory & Company.

### An Electric Singeing Machine.

A machine, the object of which is to burn off the down or short protruding fibres from yarn, is referred to in the *Textile Recorder*. The yarn appears to be passed through a tube, the wall of which is an incandescent electric conductor, the internal heat being just sufficient to perform the object of its design. It is claimed that only a little heat and no injurious gases are generated and that the heat radiated by the tube can be regulated by almost imperceptible degrees to suit any size or count or yarn. The machine is a product of the HUSSA MACHINE WORKS, 50, Church Street, N.Y.

# The Economic Situation in Belgium.

## Rapid Electrical Progress.

A REPORT bearing the above title has been forwarded to the Department of Overseas Trade by Mr. J. Picton Bagge, Commercial Secretary at the British Embassy, Brussels.*

In his introductory remarks Mr. Bagge says that the year 1925 was on the whole satisfactory, notwithstanding a general tone of pessimism. While imports fell as compared with 1924, exports were higher, in spite of increasing costs of production and dearer money. The work of reconstruction which was commenced seven years ago has now been practically completed. Factories have been re-built and re-equipped; railways, canals, telegraphs and telephones have been repaired; world markets have been regained to a great degree; and finances have been considerably straightened out. The reconstruction has been particularly marked in the great metallurgical industry, in which the capacity of production has been largely increased by the modernisation of plant and by extensions. Economy of production has been attained to a great extent by the utilisation of waste products and by co-operation between several important factories in the matter of electrical energy. The use of electrical power has been a most important feature in industrial development. Power stations have sprung up everywhere and a network of h.p. cables now covers the whole country. The network grows rapidly year by year, and is reaching the most isolated hamlets and farmsteads. One effect of this has been the re-birth of a number of cottage industries.

### Electric Light and Power.

As stated above, the development of the use of electricity for light and power purposes is astonishing in its rapidity. In 1924 the extensions undertaken by the various companies called for increases of capital amounting to over 100 million francs, and issues for a similar, if not a slightly larger, amount had to be made during 1925. These capital issues were quite independent of the sums expended by certain provincial and communal authorities. In the province of Antwerp excellent progress has been made in the northern districts with the installation of the system, which, in certain places, has been completed. In the province of Luxemburg a loan has been authorised for the electrification scheme. In the south of the province of Hainault an inter-communal co-operative society has been formed for the establishment of an electrical system. In the province of Namur work on a system is in progress, and the same is the case in the province of Limburg and in the Flanders provinces. The scheme in the cantons of Eupen and Malmédy involves the construction of a barrage in the valley of the Warche. A company with a capital of 40 million francs is carrying out the operations. In addition to the stations of private electrical companies and public authorities, a great deal of energy is produced and sold through distributing companies by the central power stations of important coal mines and industrial concerns. In this connection, the results of the co-operation in the Liége district are of interest. The system of this amalgamation, the Union des Centrales Electriques, now comprises 126 km. of cable, and 24 important sub-stations connect 29 central stations belonging to 22 metallurgical, coal, tramway, and electrical companies. The load-dispatching organisation governs the exchange of energy between the various central stations which have a total power of 125,000 kW. The exchange of energy now annually exceeds 50 million kWh or 27 per cent. of the total consumption of the affiliated works. The substitution of gas from blast furnaces and by-products for fuel which would have been consumed by the independent functioning of the machines, the stoppage or non-installation of which has been rendered possible by this co-operation, represents an annual economy of more than 70,000 tons of coal. Similar co-operation is also to be found in the Borinage, where five collieries have amalgamated for power purposes, and in the Charleroi district, where certain important metallurgical concerns have also done so.

At December 31st, 1924, there were 20 stations with a capacity of over 15,000 kW, the total being 550,000 kW. There were five stations with a capacity of between 10,000 and 15,000 kW, with an aggregate power of 55,450 kW. The total capacity of the stations affiliated to the Union Centrale Electrique de Belgique, which groups the principal distributors, is 690,000 kW. In 1924 these stations furnished 630 million kWh.

### Telegraphs and Telephones.

During 1925 a new line, 40 km. in length, was set up between Keppen and Asch, while additional wires totalling 112 km. were placed on 13 existing lines. At October 31st, 1925, the total length of the lines forming the telegraph system was 42,370 km. The contract for the equipment and laying of the La Panne-Ostend-Brussels-Herbesthal international cable was given in December last, and credits for 14 million francs have been assigned for this work in 1926. The total cost is estimated at 70 million francs.

With regard to telephones, three automatic exchanges are now in operation in Brussels and the conversion of two other exchanges is to be undertaken this year, and the remainder will be converted within the next two or three years. In the 1926 budget 124.5 million francs has been set aside for the improvement and extension of the telephone system. During the current year it is proposed to replace many overhead wires by underground cables in several districts. The total length of line at October 31st last, was 870,370 km., as compared with 786,249 km. in 1924. In the international service a number of new lines were put into commission in 1925. The lines under construction are Antwerp-Strasbourg (one line), Brussels-Nancy (two lines), Brussels-Paris (three lines), and Brussels-Rotterdam (one line).

Work on the inter-Continental radio station at Ruysleede has made good progress; the necessary buildings have been completed and are being equipped. Three high-frequency groups and three continuous current groups have been installed, and work on them is almost completed. The station is expected to be opened for service in the autumn of this year.

### General.

The Bill introduced by the Government in 1923 with a view to remedying defects in the existing regulations governing concessions for production and distribution of power, and wayleaves over roads and private property, became law in March, 1925. A Royal Decree of April further provided for the formation of a permanent consultative committee composed of between 20 and 30 members appointed for a term of four years. The object of the Committee and of any sub-committees that it may appoint, is to report to the Ministry of Industry and Labour on any question put to them by that department.

While there does not seem to be any general desire to abolish the principle of the 8-hour day, which was instituted by law in 1921, there is an outcry against its rigid application in the present abnormal economic circumstances. It is stated that more flexibility is desired in seasonal industries and in times of urgent orders, and that contracts have been lost owing to the impossibility of giving quick delivery. Several labour conflicts occurred during the past year, the most important being those in the iron, steel and constructional industries. The Charleroi iron and steel works strike had not been settled at the time of the preparation of the report (February).

* Stationery Office, 4s. net.

# Legal.

### A Long Firm Fraud.

Sentence of three years' penal servitude was passed recently at the Central Criminal Court on Hyam Reuben Spinney, wireless engineer, who was found guilty of conspiracy to defraud and obtaining goods by false pretences. Robert Banks, electrician, was sentenced to 12 months' hard labour for a similar offence, and Robert Spinney, electrician, was bound over in the sum of £5 to come up for judgment if called upon.

Mr. Percival Clarke, for the prosecution, said that the defendants were charged with conspiracy with E. J. Benson, not in custody, and other persons unknown, to defraud such persons who might be induced to part with their goods to the Hotel and Restaurant Staff Supply Co. and the Southwark Electrical and Wireless Supply Co. Banks was charged in connection with four companies—G. A. Kirby & Co., Ltd., F. Garren & Co., the Cry-set Electrical Co., Ltd., and the East End Electrical Engineering Co. Counsel said the defendants falsely represented that they were carrying on a genuine business. The period covered by the charges was from the beginning of October last year to the middle of January of this year, and the amounts involved totalled £172. Reuben Spinney took premises in Blackfriars Road and traded as the Hotel and Restaurant Staff Supply Co. and as the Southwark Electrical and Wireless Supply Co.

### G. Cohen & Sons, Ltd., v. London Transit Trading Co., Ltd.

At the Mayor's and City of London Court, on May 14th, before Judge Shewell Cooper, the plaintiffs, of Commercial Road, E., sued the defendants, importers, Long Lane, E.C., for £50 balance due on account of the purchase of a second-hand electric crane. Mr. Fortune, for the plaintiffs, said that representatives of the defendants had inspected the crane in question at a wharf, and were informed that its life as a three-ton crane was ended, but that it was safe to handle loads up to 20 cwt. The defendants agreed to purchase it for £100, but took no further action until proceedings were threatened, when they remitted a cheque for £50. In reply to a further communication, defendants replied that they had had the crane inspected by an expert, who reported that it was unfit for service. Moreover, they claimed that a verbal guarantee had been given that the crane was capable of lifting from 20 to 30 cwt. They claimed damages totalling £165 for putting the crane into condition and preparing foundations. Mr. Foxwell, giving evidence for the plaintiffs, said that the defendants' representatives had been satisfied after examining the crane for half-an-hour. He denied stating that the crane was capable of raising from 20 to 30 cwt.

Mr. Louis Sgal, who gave evidence for the defendants, maintained that that guarantee was given and that certain defects were not pointed out to them. He called witnesses to testify to the bad condition of the crane. Mr. Fortune held that it was a case of *caveat emptor*, and the Judge upheld that contention, giving judgment for plaintiffs for £50 and costs and dismissing the counter-claim with costs.

### Charge Dismissed.

Before Judge Atherley Jones, K.C., at the Central Criminal Court, on May 17th, Anatole Ivan Zaitzeff, merchant, pleaded not guilty to a charge of conspiring with others to defraud persons who might be induced to part with goods to N. A. Ludwin & Co. and Importex, Ltd., and of obtaining goods by false pretences from Messrs. Hogan and Wardrop, Ernest Flury, the Igranic Electric Co., A. J. Stevens (1914), Ltd., and others.

Mr. Dodson, prosecuting, said that the indictment alleged that prisoner, together with two men, named Ludwin and Smith-Hickie, between July, 1924, and April, 1925, obtained from seven traders radio components valued at between £1,000 and £1,200 by pretending that the goods were to be supplied to firms which were solvent, reputable, and able to pay for what they ordered in the ordinary course of business. Counsel suggested that N. A. Ludwin & Co. and Importex, Ltd., were created merely for the purpose of getting goods from reputable traders, and that there was no intention of paying for them. The goods which had been supplied to the two concerns were never paid for. The men concerned in the case were last September committed for trial on charges of conspiracy to defraud and obtaining wireless goods by false pretences. Ludwin and Smith-Hickie were dealt with but the accused went to Germany, and was extradited. In April, 1923, Ludwin took the first floor of premises at 122, Bunhill Row, in the City, and on the door of those offices the names of a number of concerns were put up, amongst them being The General Distributing and Trading Co., Ltd.; the British Overseas Dental Supplies, Ltd.; N. A. Ludwin & Co.; A. I. Zaitzieff and Co., Ltd.; and Importex, Ltd. There also appeared the name of the Lancashire Trading Co., Ltd., which in the early part of 1924 removed to 25, Budge Row. Counsel said that the accused was really that company, and the part which he played at that address was the giving of references in favour of Importex, Ltd.

The defendant, in the witness box, denied all the charges alleged against him. He stated that he had nothing whatever to do with the negotiations entered into between Ludwin and various wireless traders, beyond giving references which he said he gave in perfectly good faith. His business was a distinct one from the others and it was his misfortune that he was in the dock on the present charges.

He was found not guilty and discharged.

### Power Station Employés Charged.

At the South-Western Police Court on May 19th, George Powerswell, a pump attendant, Ernest Calf, a switchboard attendant, and George Sturley, an engine driver, all employés at the Fulham Council electricity undertaking, were charged with committing acts calculated to prevent the proper working of the power station at Townmead Road, Fulham. The prosecution was conducted by the Town Clerk of Fulham, who said that the proceedings were taken under the Emergency Powers Act. During the recent strike the whole of the electricity supply had been stopped, necessitating the closing of all factories in the borough for over an hour.

Mr. W. H. Thompson, instructed by the Electrical Trades' Union, urged that the men lost control of their judgment in the excitement. They did not attempt any damage and in shutting down the machines thought that they were acting in the best manner.

Mr. Ratcliff Cousins, the magistrate, thought that there had been no malicious intention in the men's actions, he therefore bound them over in recognisances of £5 to surrender for judgment if called upon in six months.

### Infringement of a Radio Trade Mark.

A motion by Lissen, Ltd., dealers in radio apparatus, for an injunction restraining E. Harper & Sons, trading as the Willesden Wireless Stores, from infringing its trade mark for radio goods, was mentioned to Mr. Justice Romer in the Chancery Division on May 19th.

Mr. Hodges, for the plaintiffs, said that defendants were willing to submit to a perpetual injunction, an inquiry as to damages, and to pay the costs, having agreed to treat the motion as the trial of the action.

### Neon Tube Patents Extended.

Mr. Justice Tomlin, in the Chancery Division on May 18th, heard an application on behalf of M. Georges Claude, for an extension of the period of two patents for improvements in vacuum discharge tubes for lighting purposes, and for improvements in neon tubes, owing to loss of benefit caused by the war.

Mr. Trevor Watson said that the phenomenon of the production of light by an electrical discharge was old, but M. Claude was the first man to put it on a commercial footing. Neon light was the best fog-piercer known and was of great importance for shipping and aeronautical purposes.

His Lordship granted a five years' extension in each case.

# Trade-Mark Applications.

The following are among the recent applications for British trade marks. Objections may be made against any of the proposed marks within one month from May 5th. In the case of foreign applications, the names and addresses of the British representatives are also given :—

Glyptal. No. 468,205. Class 1. Varnishes and lacquers.—British Thomson-Houston Co., Ltd.

Clayton (lettering and design). No. 459,896. Class 7. Electric road traction motors. No. 459,898. Class 22. Electric road wagons, &c.—Clayton and Shuttleworth, Ltd., and Clayton Wagons, Ltd.

Stentor. No. 455,078. Class 8. Thermionic valves.—A. C. Cossor, Ltd.

Sistoflex. No. 462,593. All goods in Class 8.—Spicers, Ltd., 19, New Bridge Street, E.C.4.

Rauland-Lyric (lettering and design). No. 459,462. Class 8. Electric transformers.—All-American Radio Corporation, Chicago, U.S.A. (E. P. Alexander and Co., 306, High Holborn, W.C.1.)

Rectron. No. 467,022. Class 8. Instruments, apparatus and parts thereof for use in radio-telegraphy and telephony.—Radio Corporation of America, New York, U.S.A. (White, Langner, Stevens & Parry, Jessel Chambers, 88-90, Chancery Lane, W.C.2.)

Cleartron, No. 468,117, and C. T. Clearton (lettering and design). No. 468,118. Class 8. Philosophical and scientific instruments for useful purposes.—Cleartron Radio, Ltd., 1, Charing Cross, S.W.1.

Edix. No. 468,196. All goods in Class 8.—The Magneto Accumulator and Electro-plating Co., Leafield Road, Dumfries.

M.K. No. 466,422. Class 8. Electric contacts, terminals, fusible cut-outs, and switches (ordinary).—"M.K." Electric, Ltd.

Traun. No. 457,274. Class 40. Hard india-rubber accumulator boxes, insulators, &c.—Heinrich O. Traun, trading as Dr. Heinrich Traun & Sohne vormals Harburger Gummi Kamm Co., Hamburg, Germany. (D. Young and Co., 11-12, Southampton Buildings, W.C.2.)